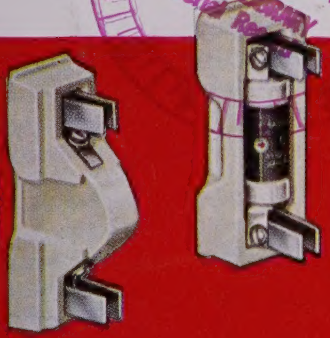
FRIDAY
8 AUGUST 1961

ELECTRICAL REVIEW

WEEKLY
PRICE 1s 6d

RECEIVED
6 SEP 1961
ARMY LIBRARY
Serial Record

‘MEMREX-EXEL’’
Range of Switchgear
Complies with B.S. 2510:1954
INGS: SWITCHES 10, 15, 30 AMPS
ITCHFUSES: 10-15-30-60 AMPS
500 VOLTS



Fuses are of the "Kantark-Exel" pattern, the bases of which will accept semi-enclosed rewirable or H.R.C. fuse carriers.

Rewirable fuses comply with B.S.3036: 1958.

H.R.C. Carriers can be supplied at no extra charge to accommodate cartridge fuse-links to B.S.88: 1952 Appendix J. Dimensions.

Pressed steel cases. Rust proofed, finished grey stove enamel.

Three knockouts provided at top and bottom and one at left hand side.

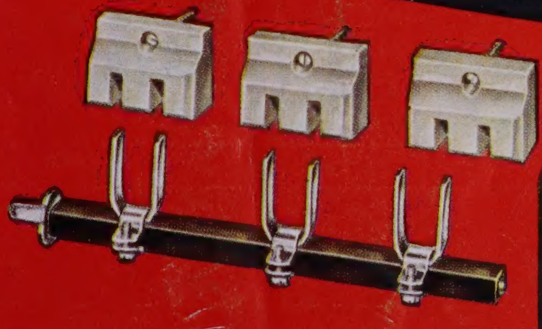
Detachable switch bar to facilitate wiring.

Screw-on porcelain safety shields serve also as arc baffles.

Complies with I.E.E. Regulations (13th Edition) and the Electricity (Factories Act) Regulations.

Front operating Switch handles.

All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.



Write for catalogue No. 450 R

MEM

The greatest safeguard an installation can have

MIDLAND ELECTRIC MANUFACTURING CO. LTD
REDDINGS LANE, TYSELEY, BIRMINGHAM 11

CIRCULATION COPY 1

RIST'S RIBBON CABLES

IF YOU are looking
for cables

Designed to operate in
limited space

In vivid colours to assist
identification of cores

Compact and neat
RIST'S RIBBON CABLES
are the answer

You can rely on RIST'S

Write for leaflet and samples

RIST'S WIRES & CABLES LT
LOWER MILEHOUSE LANE · NEWCASTLE STAFF
Sole London Distributors for Housewiring Cables and Flexibles:
LYMELITE ELECTRICAL INDUSTRIES LIMITED, 134 Pentonville Road, London, N.1. TERminus 9631/2

*B·O·A·C

*FRIGIDAIRE
REGD. T.M.

*RUSTON

*WHAT DO THESE FAMOUS NAMES HAVE IN COMMON?

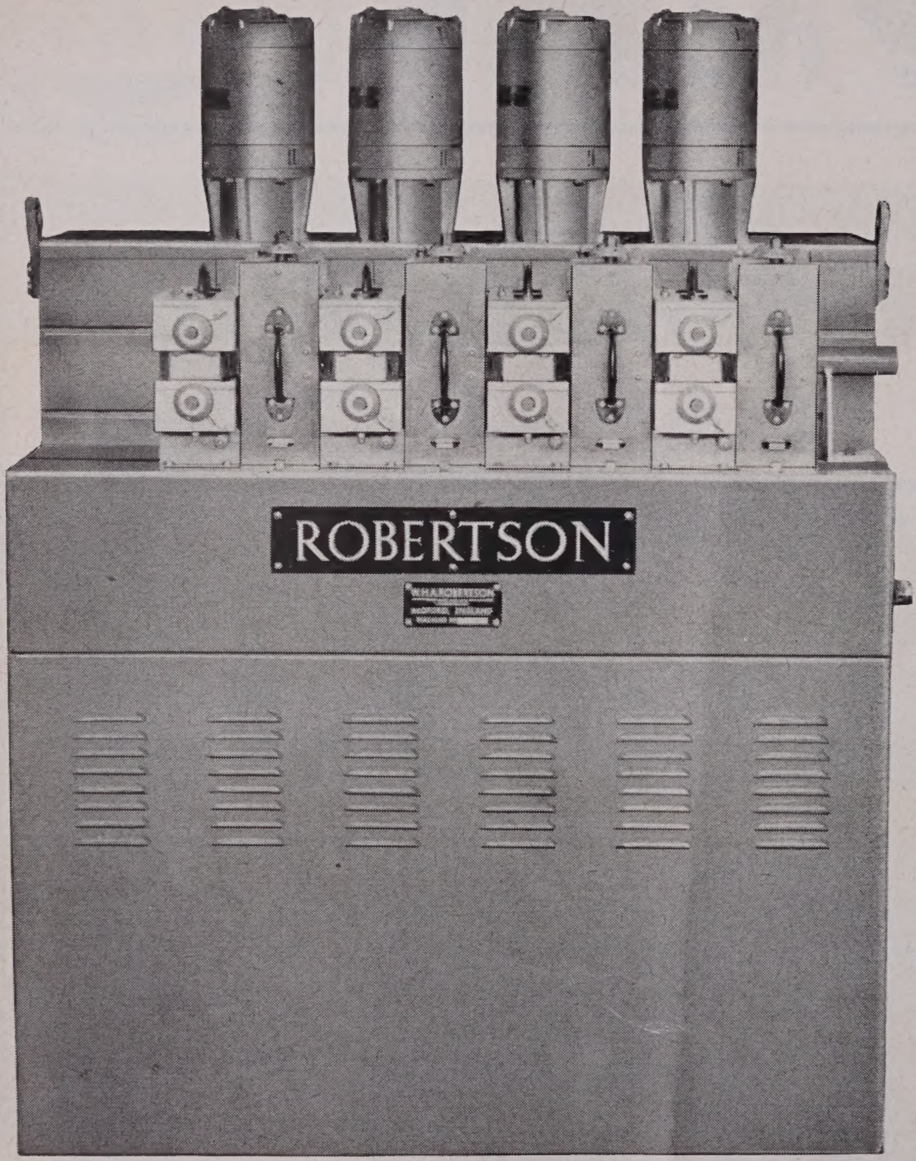
OTTERMILL

OTTERMILL SWITCHGEAR LIMITED

Sales Office: 166 Victoria Street, London, S.W.1 · Telephone: ABBey 5095-6 · Telegrams: Busbar, Sowest
Works: Ottery St. Mary, Devon · Telephone: Ottery St. Mary 500 · Telegrams: Busbar Ottery St. Mary

Leading manufacturers of SWITCHGEAR, BUSBAR TRUNKING & RISING MAIN SYSTEMS

ROBERTSON



NEW
Machine for the Electrical Industry

Eight-Stand Roll Type Reducing Machine for compacting magnesium oxide powder or other filling in tubular heating elements.

Advantages over Swaging are:

Continuous compression from one pair of rolls to the next without impacts and vibration.

Silent in operation.

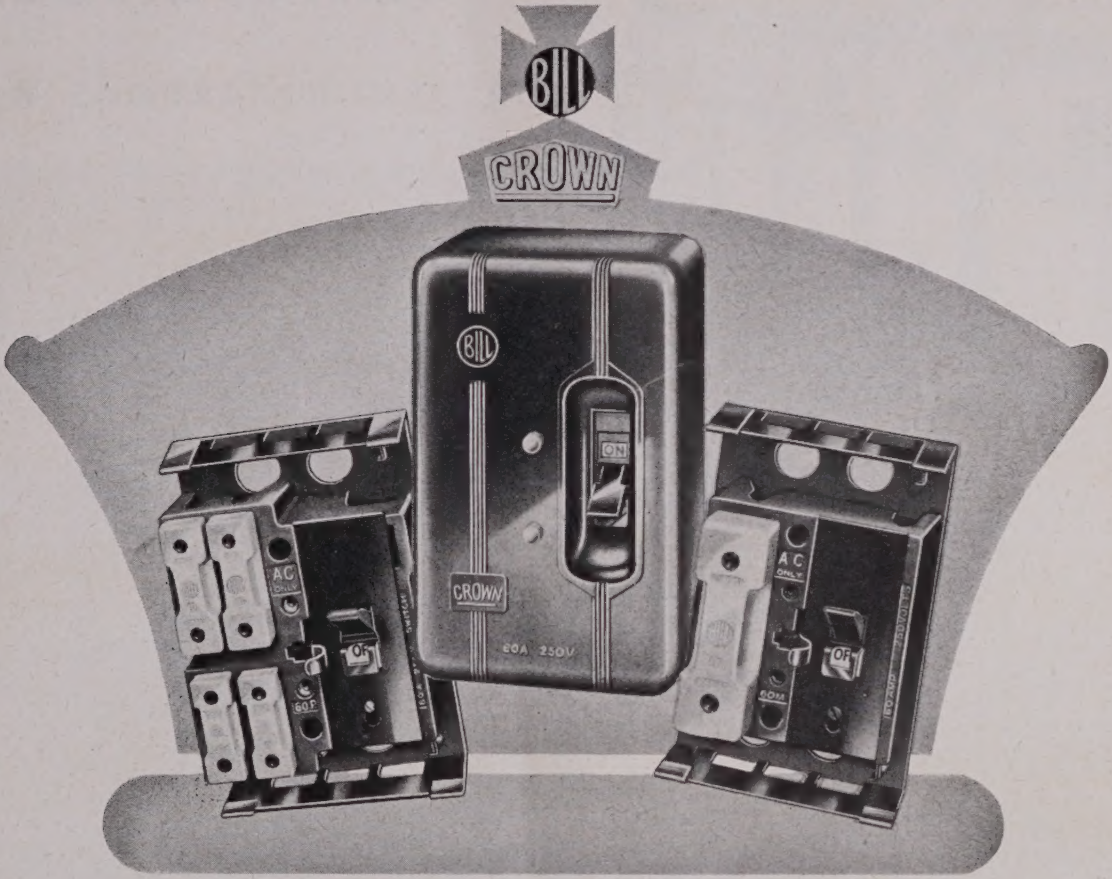
Elongation from one element to the next is approximately constant.

Production rate is higher — 60 feet per minute.

W. H. A. ROBERTSON & CO. LTD. BEDFORD, ENGLAND

WT. 368T

You cannot buy better gear



SWITCHFUSES AND SWITCH SPLITTERS
NEW PRICES

- A RANGE OF S.P. & N. MAIN SWITCHGEAR FOR MODERN DOMESTIC INSTALLATIONS.
- AVAILABLE IN 15, 21, 30, 34 AND 60 AMP. SWITCH RATINGS.
- SAFE AND RELIABLE SLOW-BREAK A.C. FRONT OPERATED SWITCHES.
- ALL-INSULATED OR METAL CASES—FULLY INTERLOCKED FOR SAFETY.
- VITREOUS PORCELAIN FUSES IN H.R.C. OR BILL ARC DAMPING TYPE.

ASK FOR ILLUSTRATED PRICE LIST No. CR.761

PRICE LIST PL.561 OR NEW CATALOGUE G.561 NOW AVAILABLE

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ASTON LANE · PERRY BARR
BIRMINGHAM·20

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N. PAYNE,
R. W. HANKINSON,
GILLINGHAM ST.

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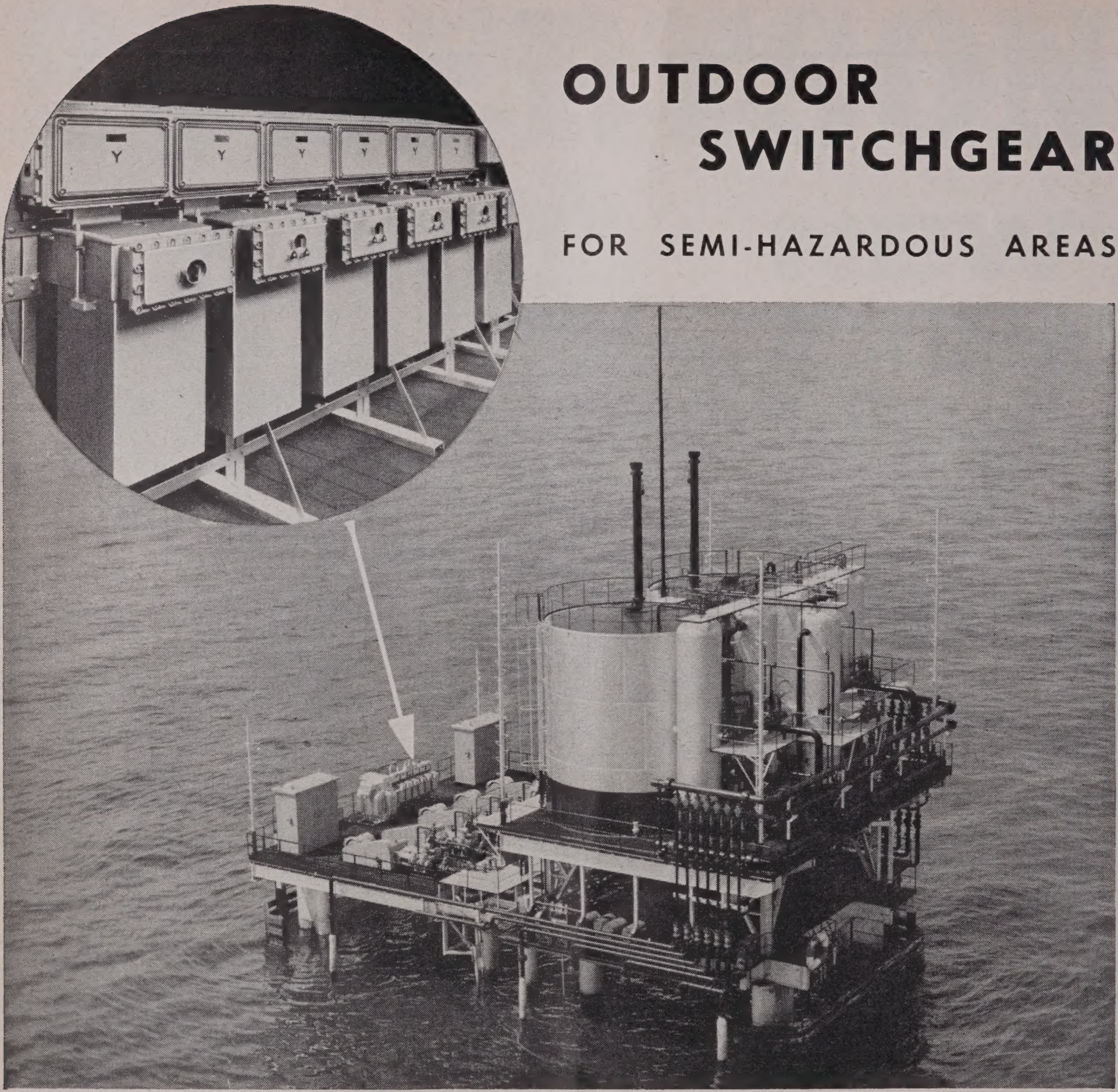
OUTDOOR SWITCHGEAR

FOR SEMI-HAZARDOUS AREAS



Photograph by courtesy of Shell International Petroleum Co. Ltd.

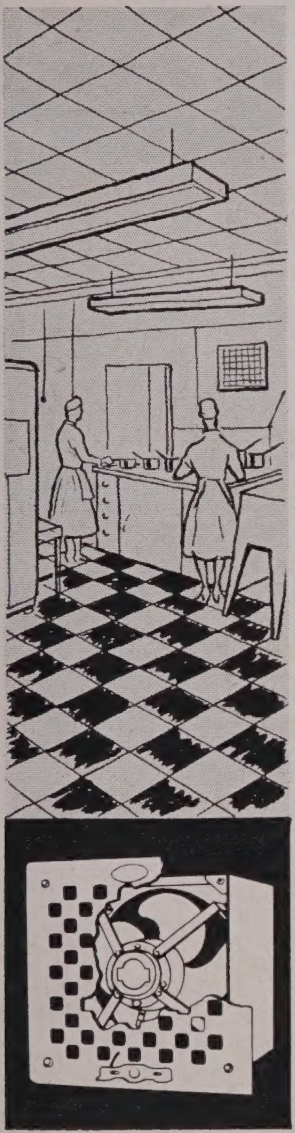
One of a large number of Motor Starter Switchboards, non-sparking, installed 15 miles off-shore on Oil Gathering Stations in Lake Maracaibo (salt water) Venezuela. These switchboards are completely weatherproof and operate under the most exacting climatic conditions conceivable.

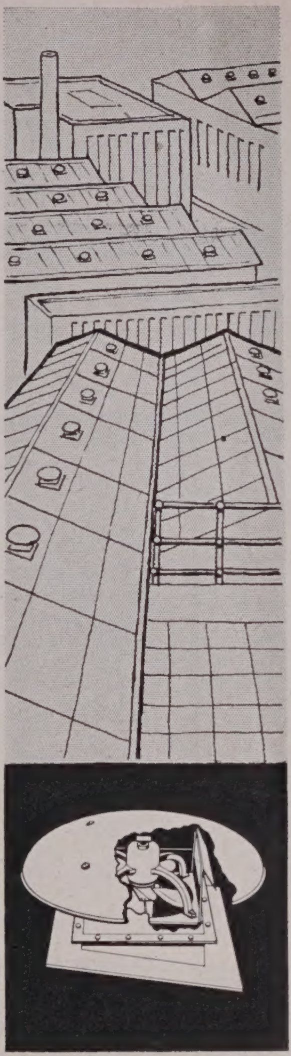
ELECTRO MECHANICAL MFG. CO. LTD.

Head Office and Works : Eastfield, SCARBOROUGH
Telephone : Cayton Bay 441-2

London Office and Showroom : 133-135 Grand Buildings, Trafalgar Square, LONDON, W.C.2
Telephone : Whitehall 3530

Subsidiary of Yorkshire Switchgear and Eng. Co. Ltd.





Fenton Byrn wall fans are purpose-made for installation in offices . . . kitchens . . . hospitals . . . licensed premises . . . clubs . . . restaurants. Fenton Byrn wall fans . . . recess smoothly into walls to blend with any decor. There's high operational efficiency, and a choice of fixed or closable grilles. A wide range of sizes is available and black out attachments.

Fenton Byrn roof ventilators offer powerful, motorised **regulated** ventilation. They are fitted with automatic shutters—close as soon as the motor stops to eliminate back-draught. They are completely weather- and vermin-proof—and there's no heat loss.

For those who want a ring fan . . . Fenton Byrn ring fans in a wide range of sizes give long periods of maintenance-free service.

And for those who want a fan for special purposes, for manufactured units—heaters, underground ventilation plant, spray booths, etc.—Fenton Byrn can provide a fan to meet the need.

Fenton Byrn fans . . . backed up by research—And the Fenton Byrn advisory service is ready, willing and able to deal with your problems . . . to keep you ventilated.

Ask for leaflets:
Wall Fan, No. F/3/2;
Roof Ventilator, No. F/8/1;
Ring Fan, No. F8/9/2.

Ventilation is needed . . .
then see
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FENTON BYRN & CO. LTD.

West Molesey, Surrey
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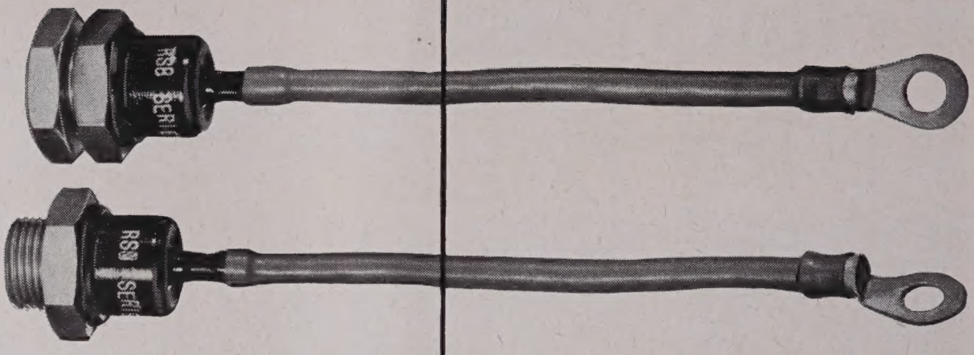
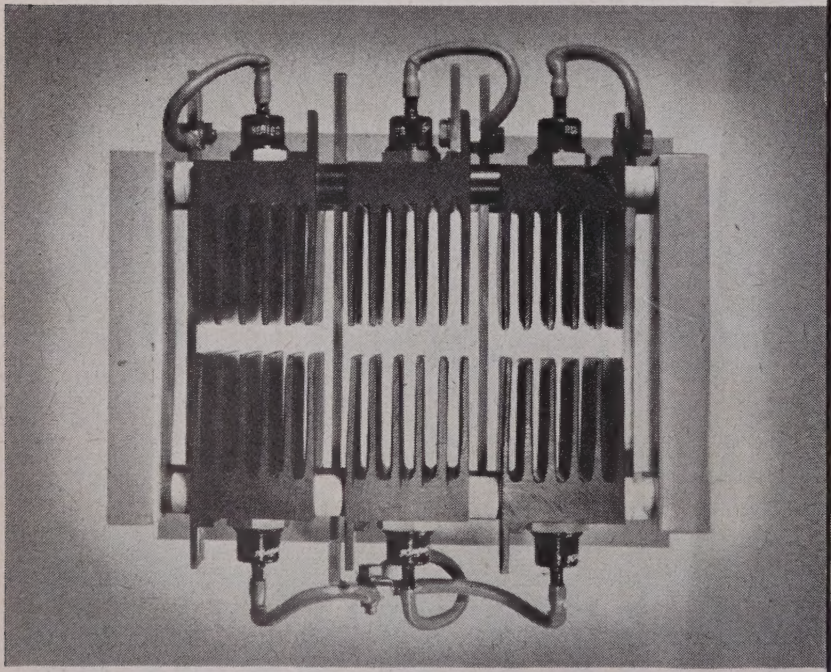
P8790



SenTerCel

RS8 SILICON POWER DIODES and RS8 SILICON RECTIFIER STACKS



SenTerCel series RS.8 High Power Silicon Diodes incorporate an alloyed junction in a stud-ended, hermetically-sealed case. These devices are of rugged construction and are intended for use with a heat sink.

SUPPLIED AS:—

Single Diodes.
Single Diodes with separate heat sinks.
Complete assembled rectifier stacks in frame with heat sinks; in various sizes and circuits to provide a variety of current and voltage outputs.

RATINGS OF SINGLE DIODES

Ratings of single diodes range from 50 to 400 volts (crest working voltage).

Maximum continuous forward current at maximum rated stud temperature	120 amperes
Maximum current (half wave resistive load) at maximum rated stud temperature	100 amperes mean DC
Maximum rated stud temperature	100°C
Maximum mean dissipation (with suitable heat sink)	150 watts

CHARACTERISTICS OF SINGLE DIODES

Maximum forward voltage at 100 amperes at maximum rated stud temperature	1.2 volts
Full-cycle average reverse current at rated C.W.V. at maximum junction temperature	15 milliamperes

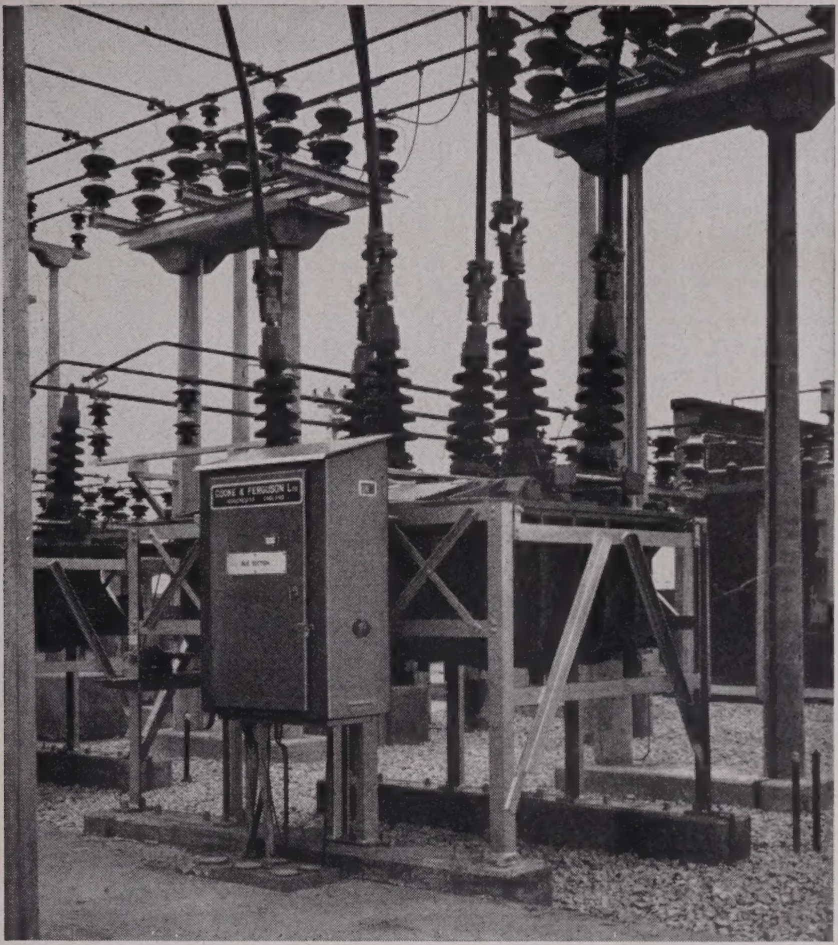
Write for Advance Information Leaflet to:—

STC COMPONENTS GROUP

Standard Telephones and Cables Limited

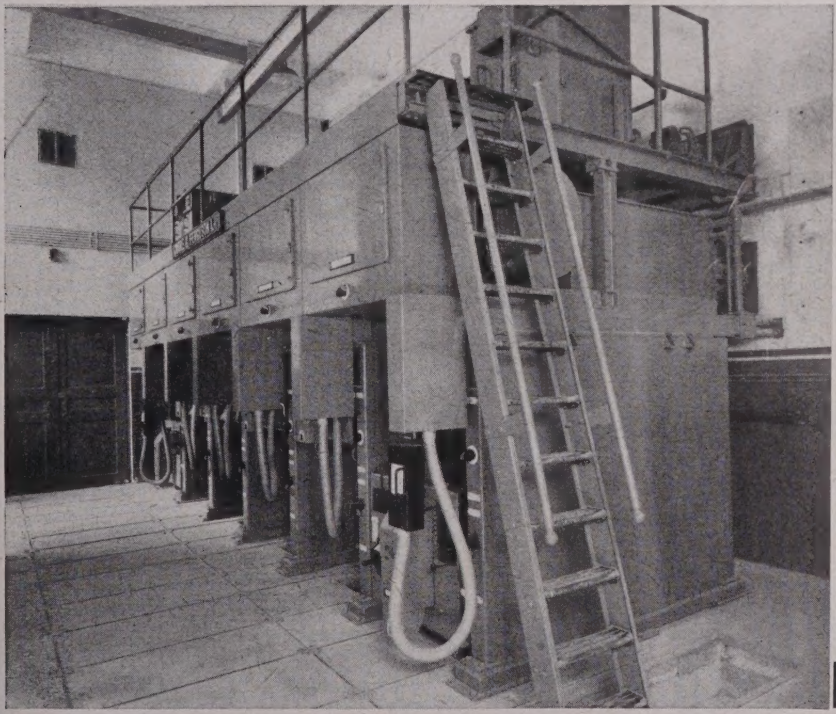
RECTIFIER DIVISION: EDINBURGH WAY · HARLOW · ESSEX

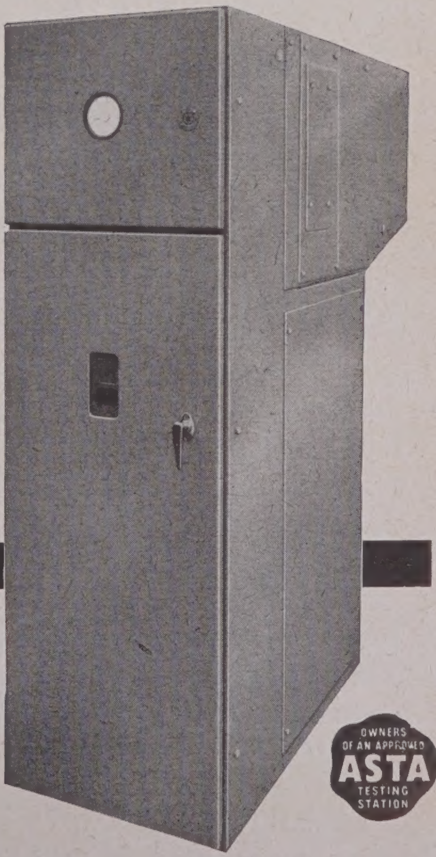
60/8MF



For outdoor
or indoor
switchgear

**...UP TO AND
INCLUDING
66 kV**





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ASTA
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Cut cable costs with Noral Aluminium

Aluminium is a good conductor, and equally important, an economical one, often reducing costs by as much as 25 per cent. It is being used more and more in modern power and tele-communication cables–for the current-carrying cores, for protective sheathing, or for both. If you use electric cables, it is worth looking into the savings that aluminium offers. Alcan Industries can advise on suppliers and on jointing techniques. Get in touch with our Sales Development Division at Banbury, or with any of the offices listed below.

Cable laying on the British Railways London Midland Region electrification scheme: photograph by courtesy of British Insulated Callender's Cables Ltd.

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Makers of Noral Alloys

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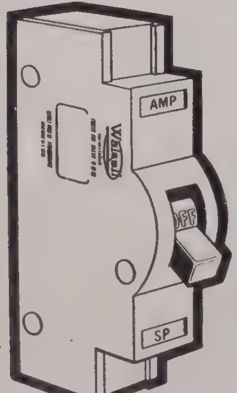
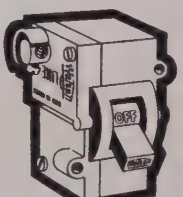
ALCAN

TBW/N81



'S' RANGE



'W' RANGE

'A' RANGE

"WAL-BREAK"
MINIATURE
CIRCUIT
BREAKERS

COMPLETE CONTROL

and protection of an electrical circuit is achieved by the use of miniature circuit breakers, ensuring safety in all situations.

Three types are available:

"S" range — 5 to 60 amps.—Single pole to triple pole and neutral ways. Neutral switched or solid.

"A" range — 4·5 to 30 amps.—using four ratings each adjustable to circuit conditions.

"W" range — 5 to 15 amps.—an all insulated unit to fit a standard BSS. 1299 box

Walsall

WALSALL CONDUITS LTD., EXCELSIOR WORKS, WEST BROMWICH
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o supply the continuous flow of accurate functional information on which ficiency in every field of industry depends today, SMITHS Industrial Division rovides appropriate instruments and installations for indicating, counting, ontrolling or recording such variables as speed, time, flow, pressure, mperature, quantity, volume and quality. If you have an information problem oncerning the functioning of any equipment, however difficult, let us send a echnical Representative to see you. Even if the answer does not already ist, we can probably evolve it.

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The Industrial Division of
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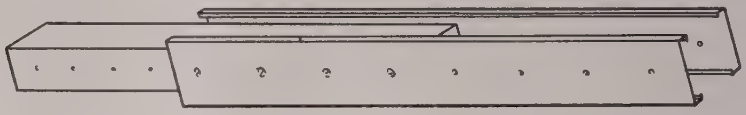
SID A1

speed

CRYSELCO TRUNKING is simple to assemble and very quick erection is possible by using the special suspensions. Two men working under normal conditions can erect several hundred feet of trunking in a day. Other electrical services can be carried in the wiring ducts on each side of the centre section. Additional fittings can be erected in a matter of minutes and the existing ones can be repositioned merely by loosening two screws.

↓

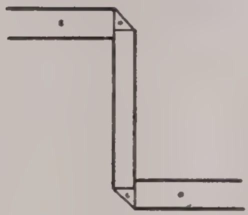
rigidity



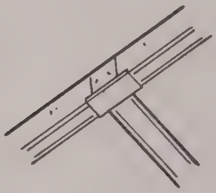
The overlap method of construction ensures fixings up to 18 ft centres

↓

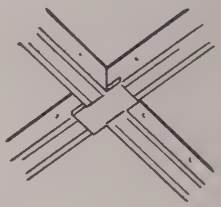
flexibility



90° riser



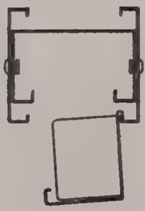
T joint



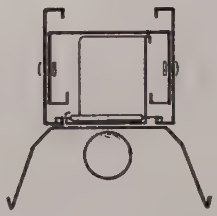
crossover

↓

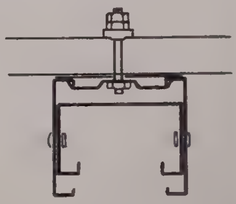
adaptability



easy maintenance



easy assembly



easy erection

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CRYSELCO TRUNKING LIGHTING SYSTEM

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REDUCED INSTALLATION COSTS

Remember to order CRYSELCO Lamps at the same time

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CRYSELCO LIMITED KEMPSTON WORKS BEDFORD

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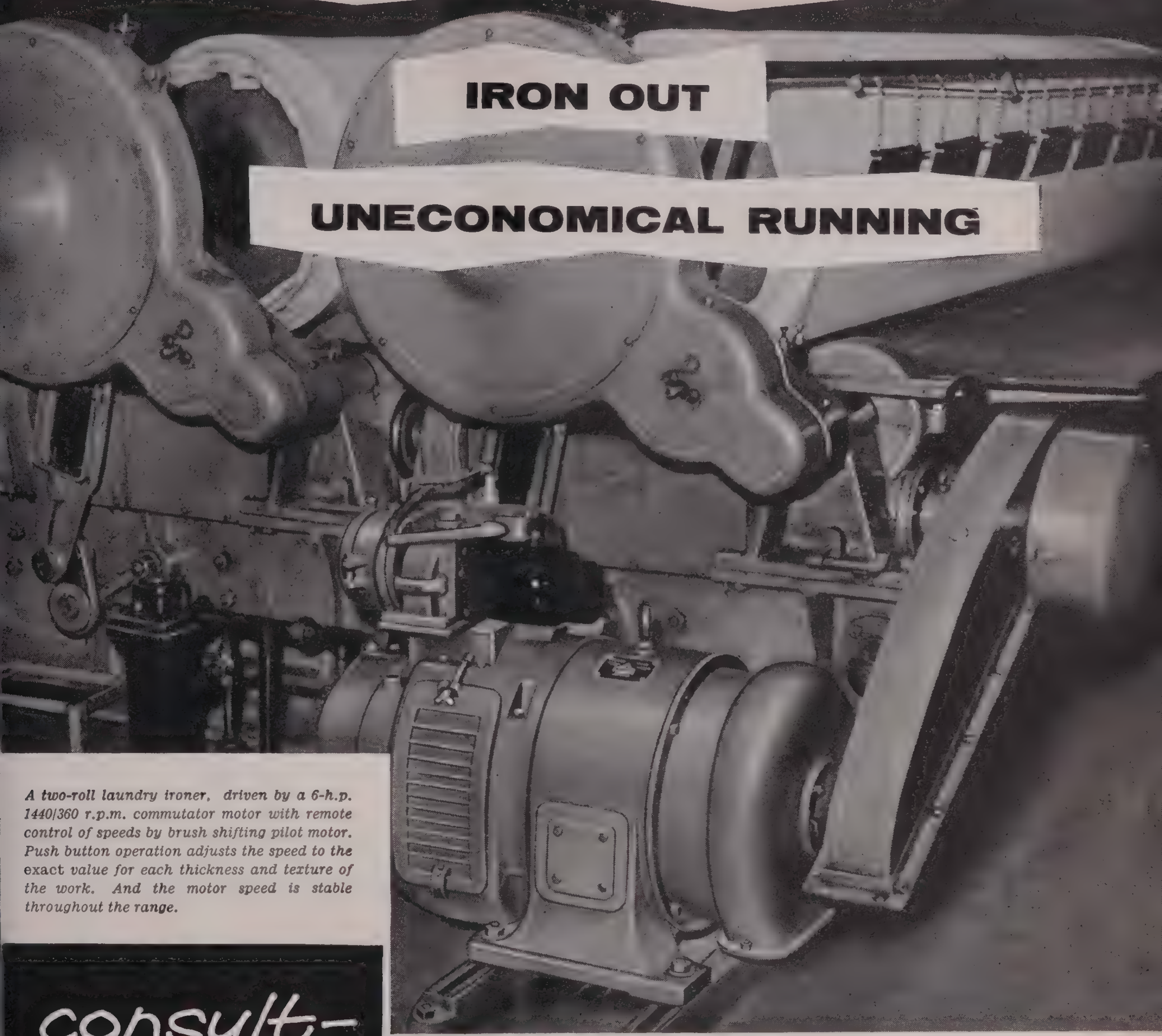
FULLER COMMUTATOR MOTORS



A two-roll laundry ironer, driven by a 6-h.p. 1440/360 r.p.m. commutator motor with remote control of speeds by brush shifting pilot motor. Push button operation adjusts the speed to the exact value for each thickness and texture of the work. And the motor speed is stable throughout the range.

consult-

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A member of the Hawker Siddeley Group

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FULLER ELECTRIC LIMITED
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Also at Birmingham, Glasgow and Manchester

In this instance, a Fuller Variable Speed A.C. Commutator Motor enables this laundry ironer to provide the exact finish required without waste of time and current. But these motors can be applied to any industrial process.
The INFINITE variable speed characteristic of the Fuller A.C. Commutator Motor means that your machine can be operated at precisely the exact speed to give maximum output of quality and quantity. The speed required is maintained irrespective of normal load variation. Commutator Motors require no resistance or external regulator; current consumption is reduced at lower speeds bringing savings in power costs.
We shall be glad to explain how your factory can benefit by using Fuller Commutator Motors.

Major industries use P & B relays for protection

Courtesy: Bowater Paper Corporation Ltd.
Shell Refining Company Limited
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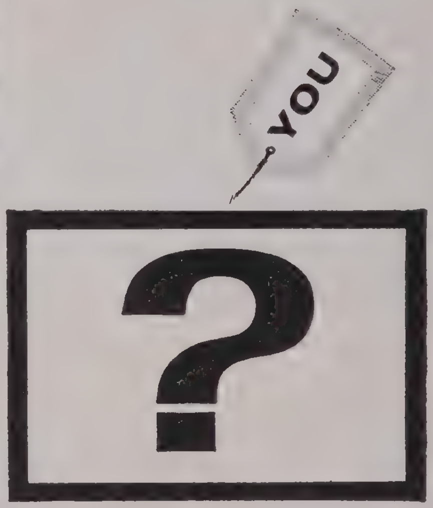
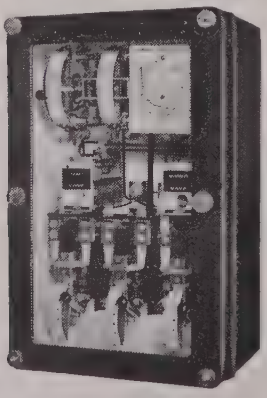


P & B GOLDS RELAYS
protect against phase failure, overload, short circuit, earth fault.

P & B STALLING RELAYS
give complete protection against stalling under all conditions.

P & B RELAYS
give protection to industry throughout the world.



PLEASE ASK FOR LITERATURE

P&B
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P & B ENGINEERING COMPANY LIMITED
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Birmingham & South Wales: Tel. Fouroaks 2025
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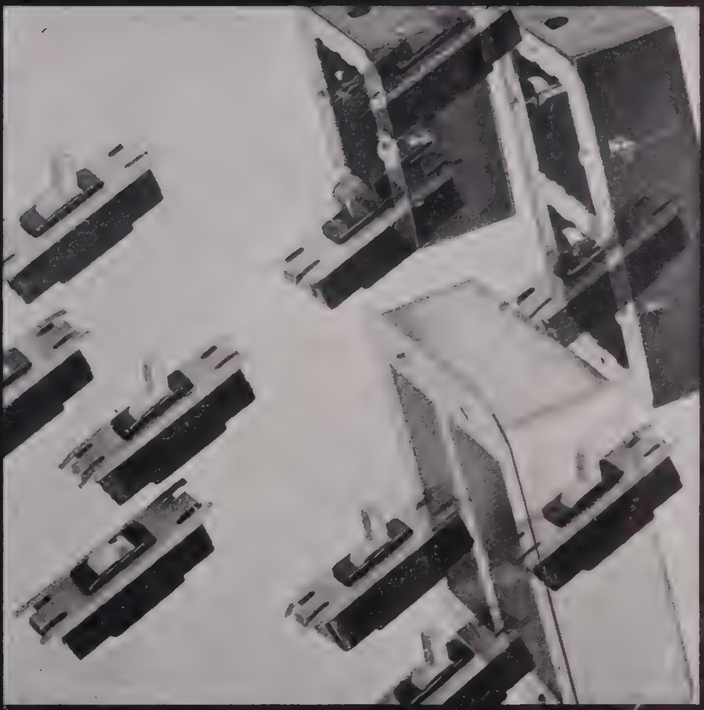
complete interchangeability with 'MUTAC CLIPPER'

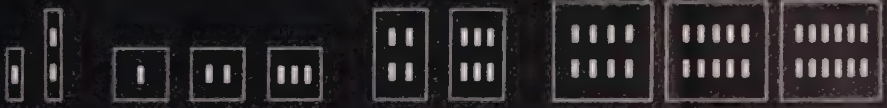


G.E.C. Installation Equipment Group have a *new approach* to designing switches. Now you can fit any of the 11 interchangeable 'Mutac Clipper' switch units into just 3 different sizes of grids and boxes . . . for example, 3 switch units into a standard BS 1299 or plaster depth box. G.E.C.'s new approach makes 'Mutac Clipper' switches unrivalled for ease and speed of assembly . . . ensures that these precision-made, electronically-tested switches give a *guaranteed* long-life performance . . . takes the clicking out of switching.

Interchangeable switch units:

- 5 amp 1 way S.P.
- 15 amp 1 way S.P.
- 5 amp 1 way D.P.
- 5 amp 2 way S.P.
- 5 amp 2 way & off
- 5 amp intermediate
- 5 amp 1 way secret
- 5 amp 2 way secret
- Bell Push
- Neon Indicator
- Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach.* Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.



. that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

IMMEDIATE DELIVERY of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information ask your wholesaler for 'Mutac Clipper' literature.

The SANTON

'DUAL'

ELECTRIC IMMERSION HEATER.

The perfect dual purpose heater with a SEPARATE CONTROL unit which enables your customer to obtain the maximum benefit from the heater's Bath-Sink elements.

The control can be fitted in any position most convenient to the user, and where it can be seen at a glance which element is on, Bath or Sink. In this way your customer will not pay for more hot water than is required, for with the *visual* control the busy housewife will not heat unnecessary quantities of water through forgetfulness.

Sell your customer economic electric water heating at the new reduced price.

	Heater	P. Tax	Thermostat	Control Switch
23", 27" & 30"	£3 5 0	13 1d	£1 15 0	£1 10 0
36"	£3 10 0	14 1d	,	
42"	£3 15 0	15 1d		

● **FULL DETAILS AVAILABLE ON REQUEST.**

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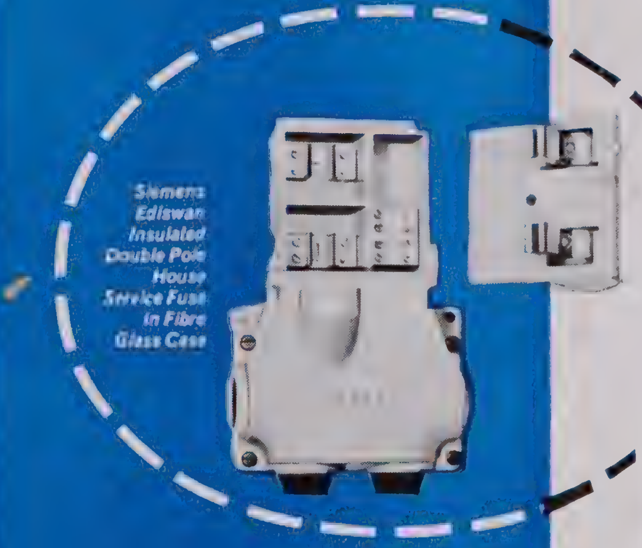

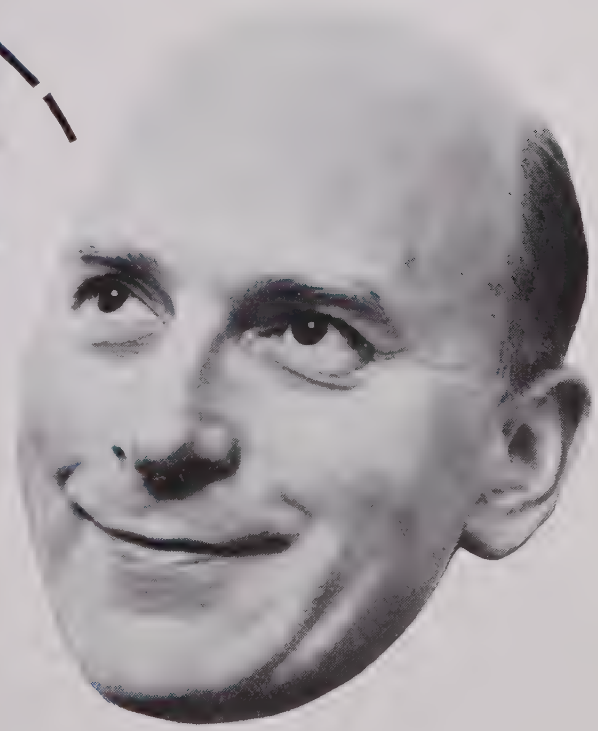

Distribution Problem?

Just think of the equipment with the AEI name behind it!

Distribution pillars and panels – Underground disconnecting boxes, branch boxes, service boxes and straight-through joints – Indoor and outdoor terminal boxes – Indoor and outdoor service fuses – H.T. and super-tension joints and sealing ends – Overhead service accessories – Rising mains systems – House service fuses and consumers' control units – Jointing materials and accessories of every description.

AEI CABLE DIVISION
Associated Electrical Industries Limited
DISTRIBUTION EQUIPMENT SALES DEPARTMENT
145 Charing Cross Road, London, W.C.2 *Tel: GERrard 9797*

UNICUBE MOTOR CONTROL BOARDS AND PUSHBUTTON STATIONS ARE INSTALLED THROUGHOUT THE WESTFIELD WORKS

Britain's first Lurgi High pressure complete gasification plant installed at Westfield, Fife, is now producing 15 million cubic feet of gas per day and when the second stage is completed almost one fifth of the present Scottish demand will be supplied from Westfield—a tribute indeed to The Scottish Gas Board.

Main Contractors: Messrs. Humphreys & Glasgow Ltd.

M. & C. SWITCHGEAR LTD.

KIRKINTILLOCH, GLASGOW. Phone Kirkintilloch 2216

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Phone 25178

MIDLANDS
12 Perrin Avenue,
Kidderminster
Phone 3106

NORTHWEST
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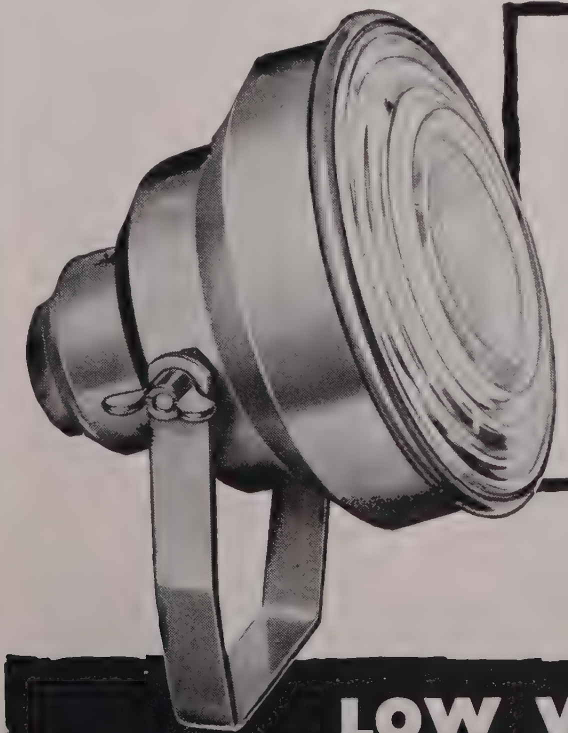

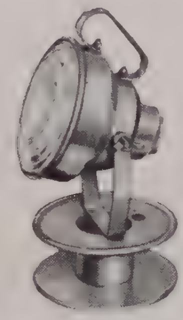

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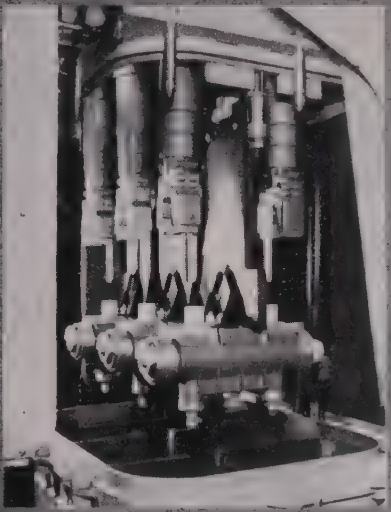

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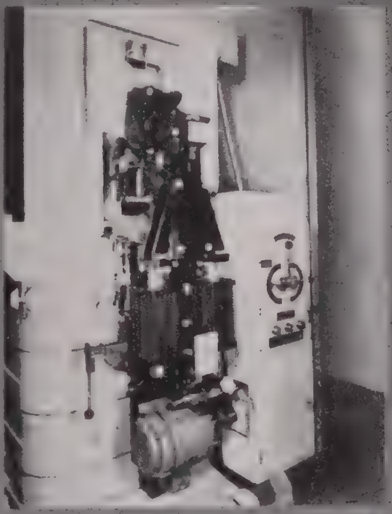

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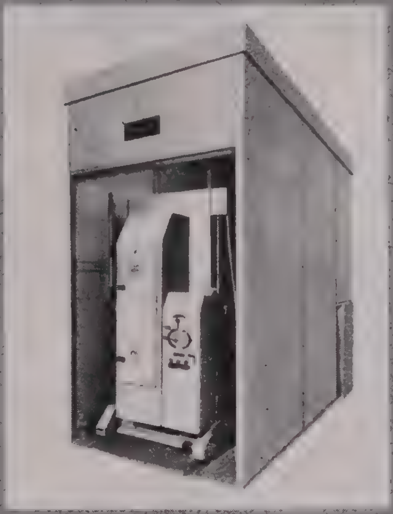

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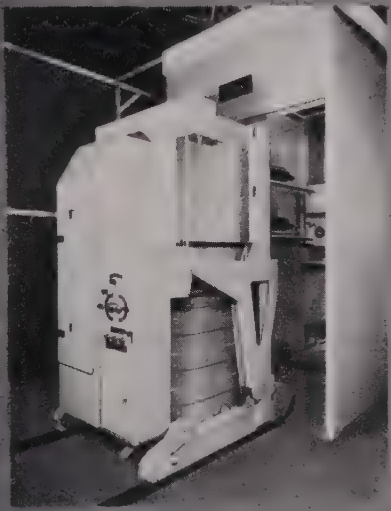

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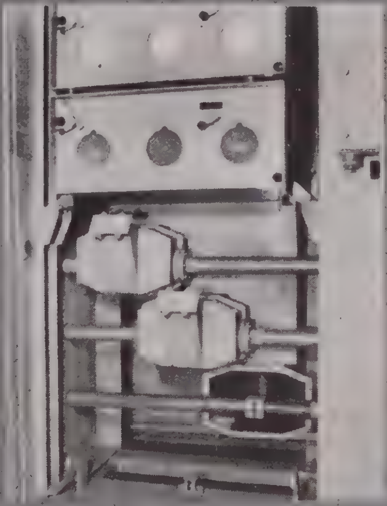
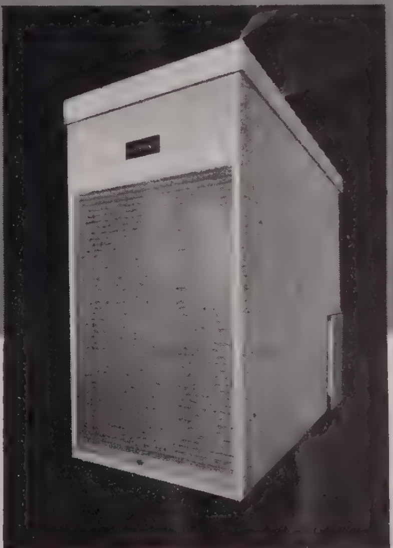


CONDENSER TYPE BUSBARS WITH
TEE-OFF JUNCTION BOXES.



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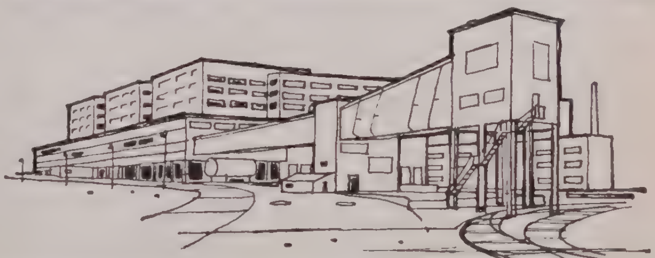

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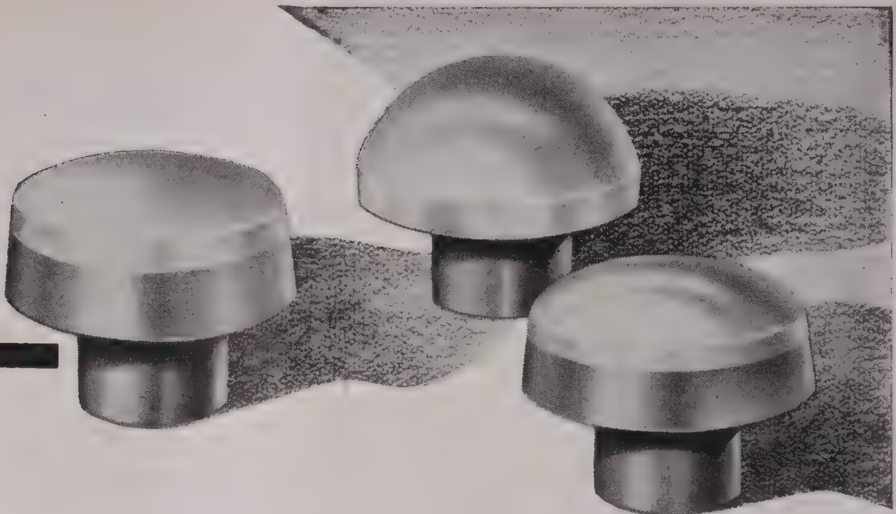

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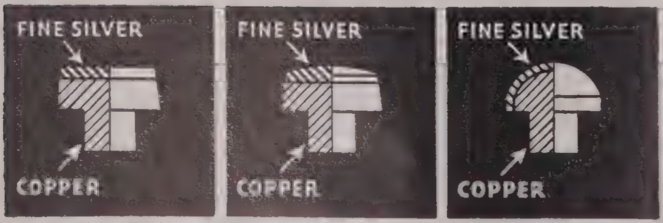

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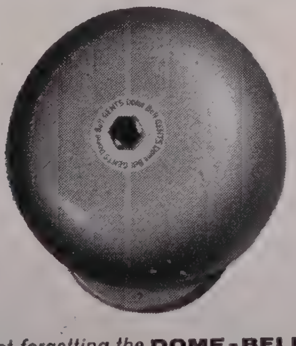

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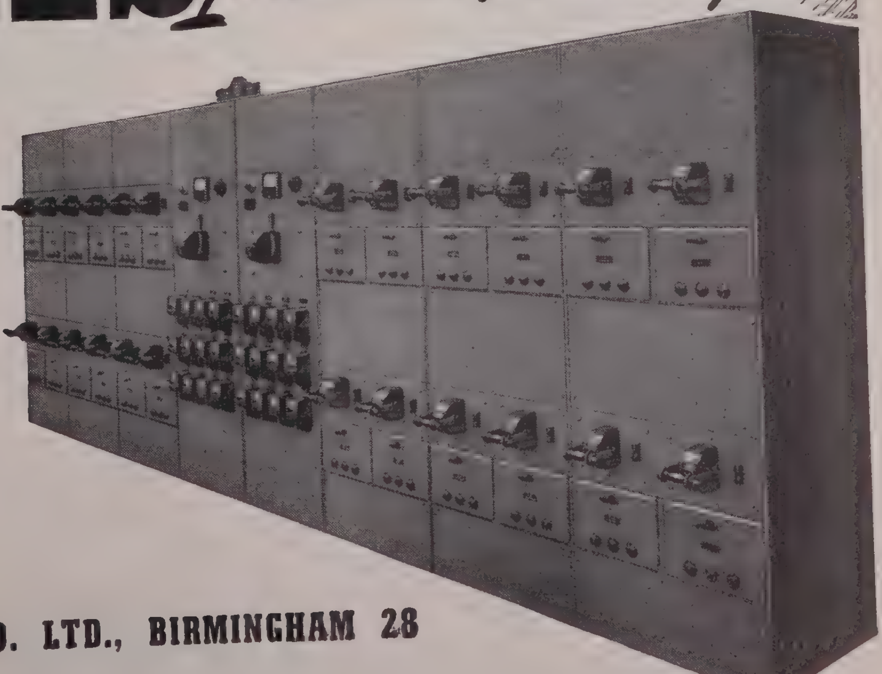

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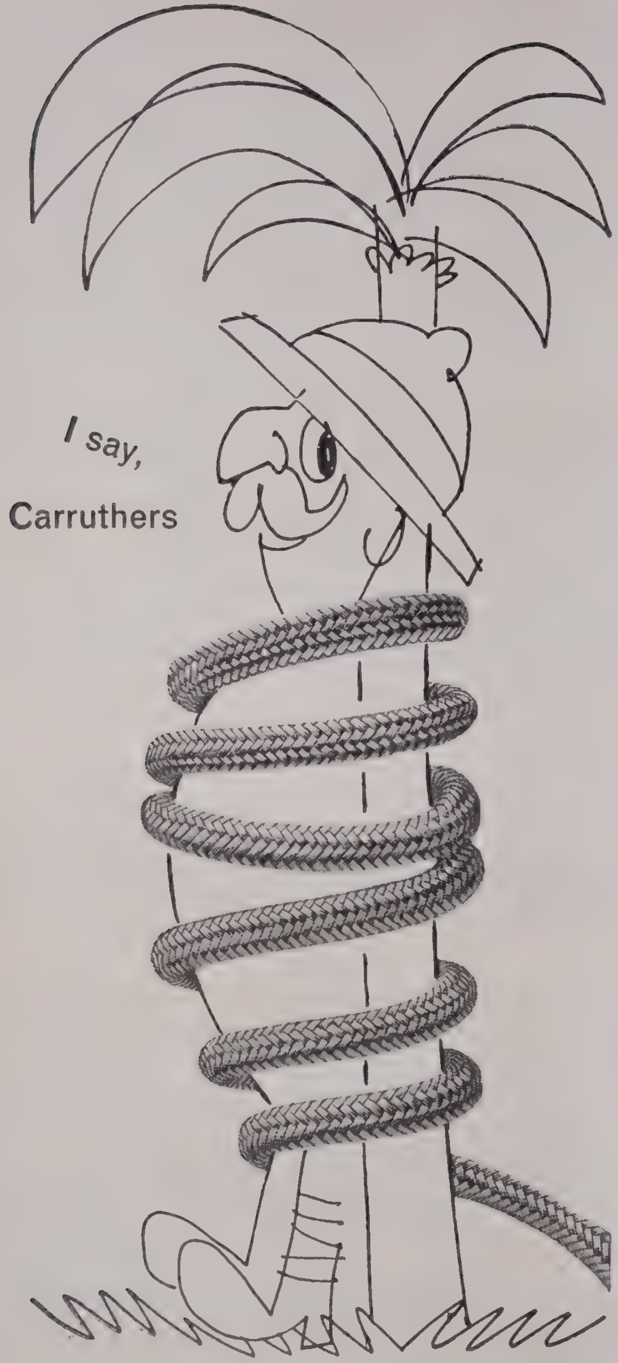

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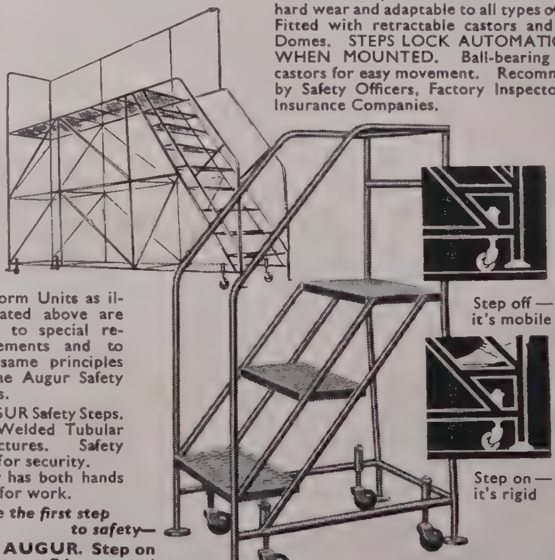

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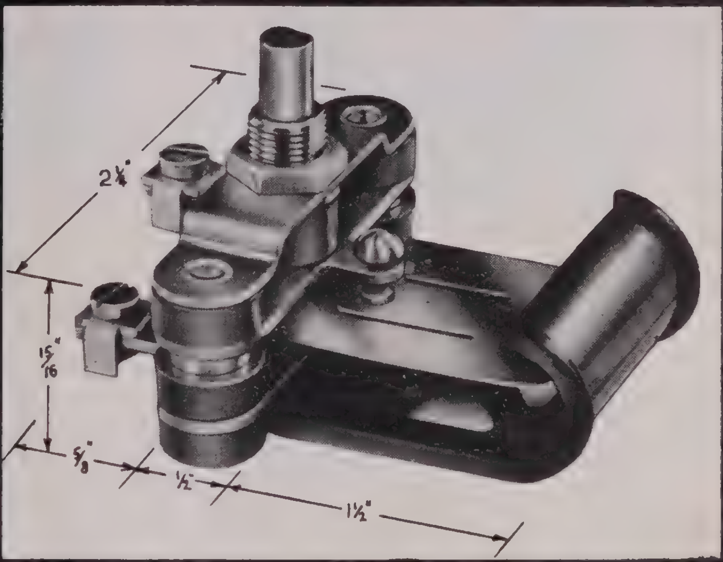
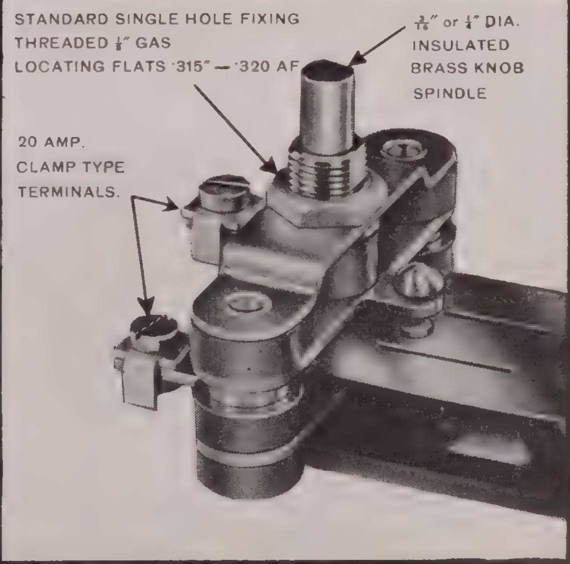


FEATURES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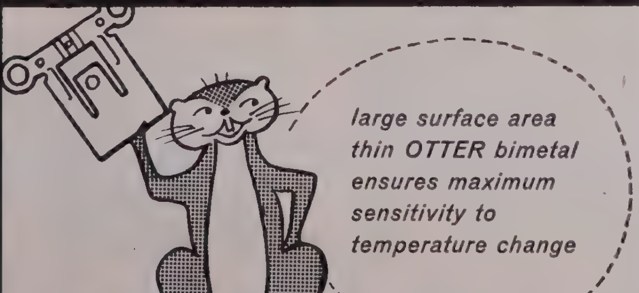
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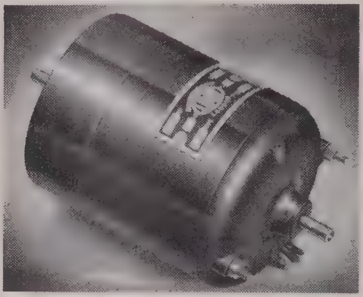

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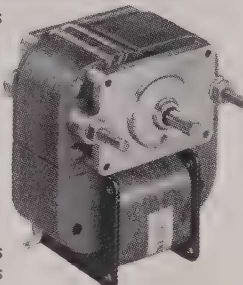

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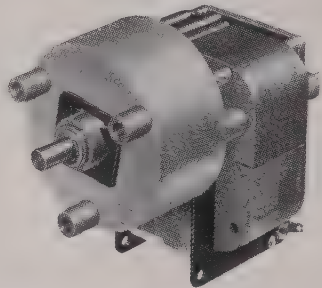

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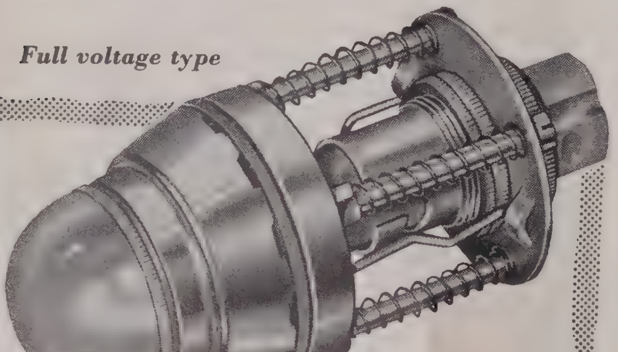

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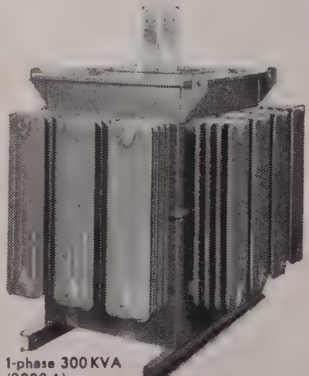

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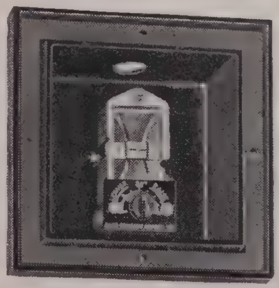

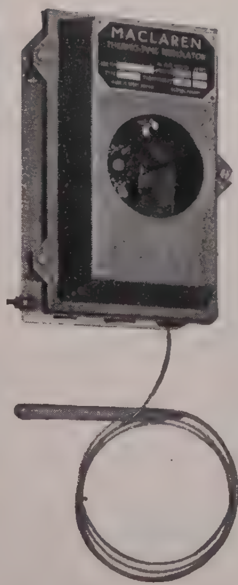

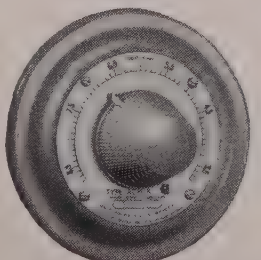

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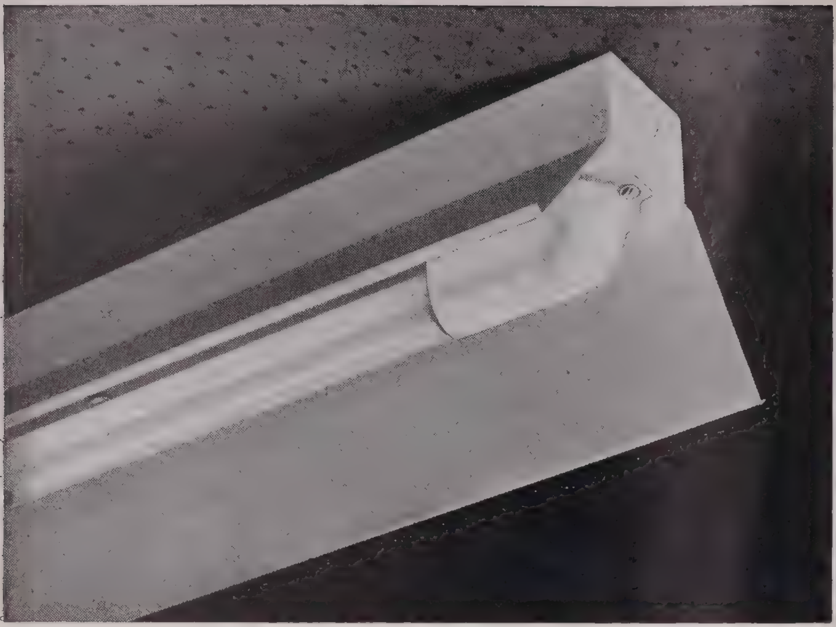

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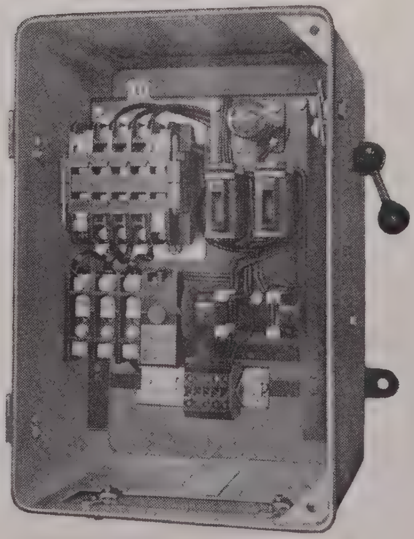

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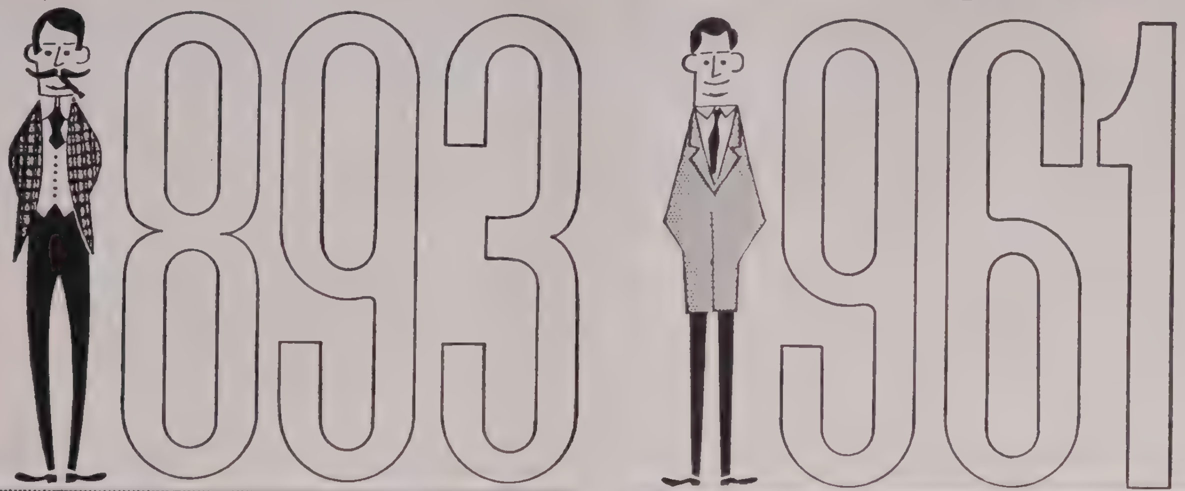

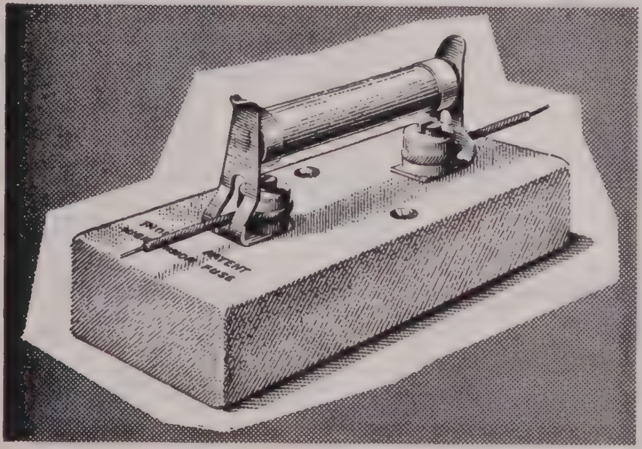

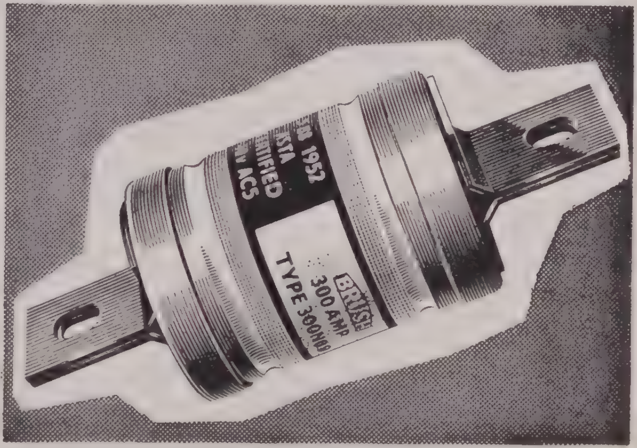

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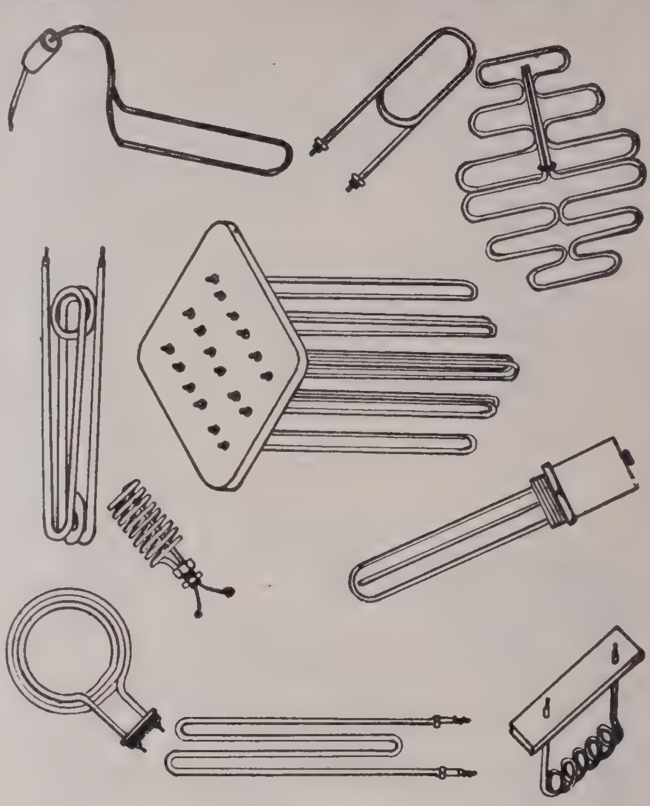

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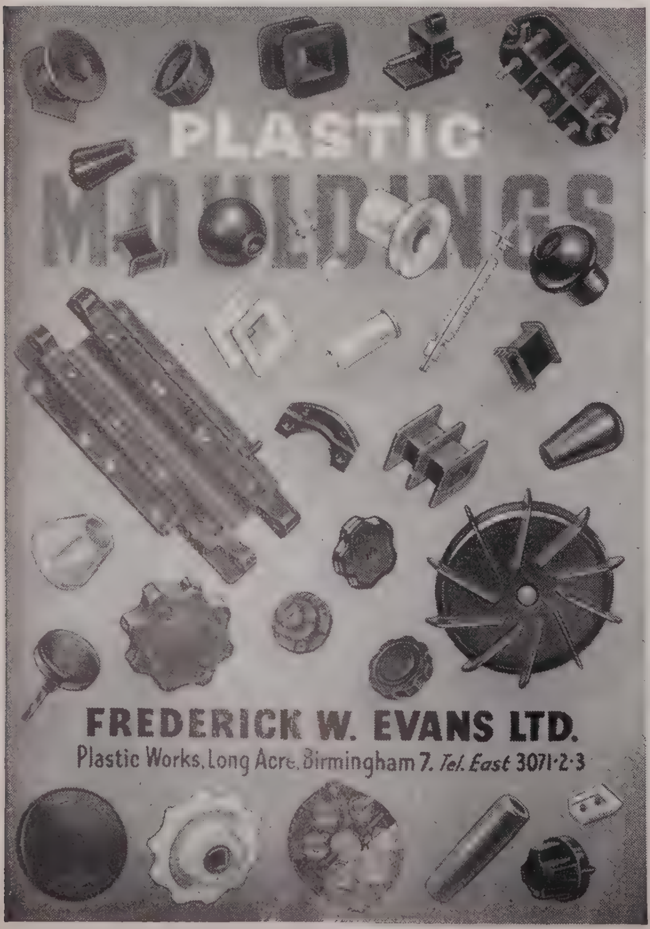

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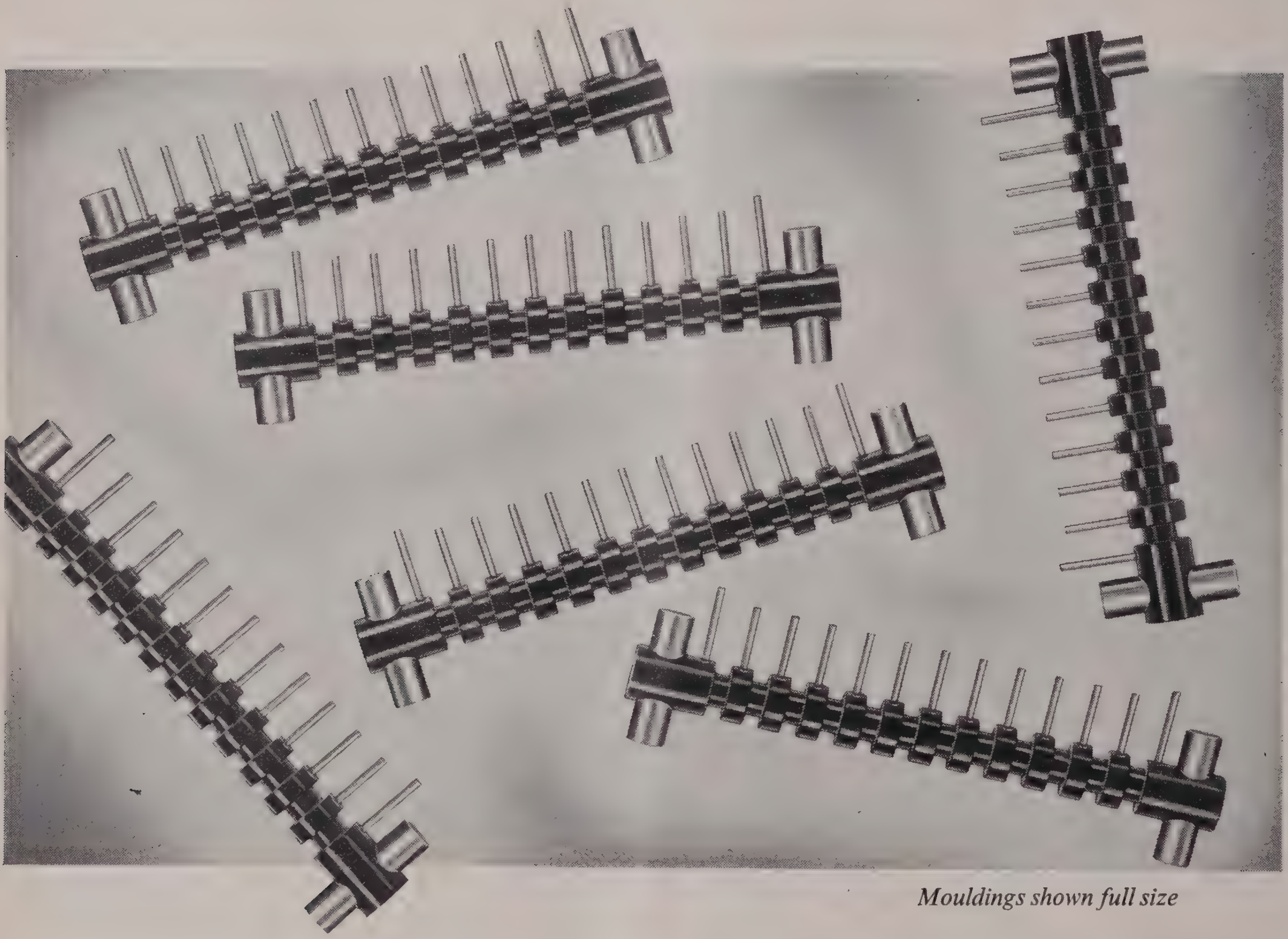

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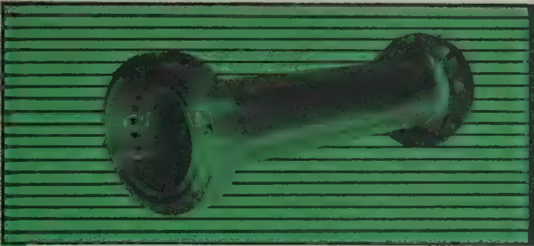

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London Transport Executive, as the first stage of its re-equipment of the "Underground" ordered new "Silver" rolling-stock for the Piccadilly Line. This stock, seventy six seven-car train sets, is fitted with Hoffmann Roller Bearing Axleboxes, and Hoffmann Roller Bearing Suspension Units.

London Transport Executive is now also re-equipping the Central and Metropolitan Lines, and has placed orders for a further 4,332 Hoffmann Axleboxes and 1,332 Suspension Units to be fitted to the new "Silver" stock coming into service on these lines.

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The illustration shows engineers assembling bogies for the "Silver" coaches built for the Piccadilly Line by Metropolitan-Cammell Carriage and Wagon Company Ltd., who, with Cravens Ltd., and British Railways are supplying the new "Silver" trains for the Central and Metropolitan Services.

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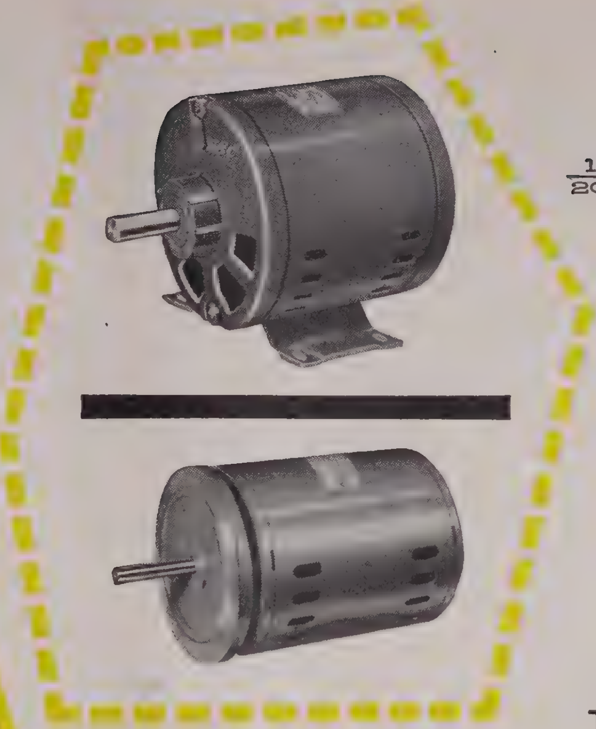

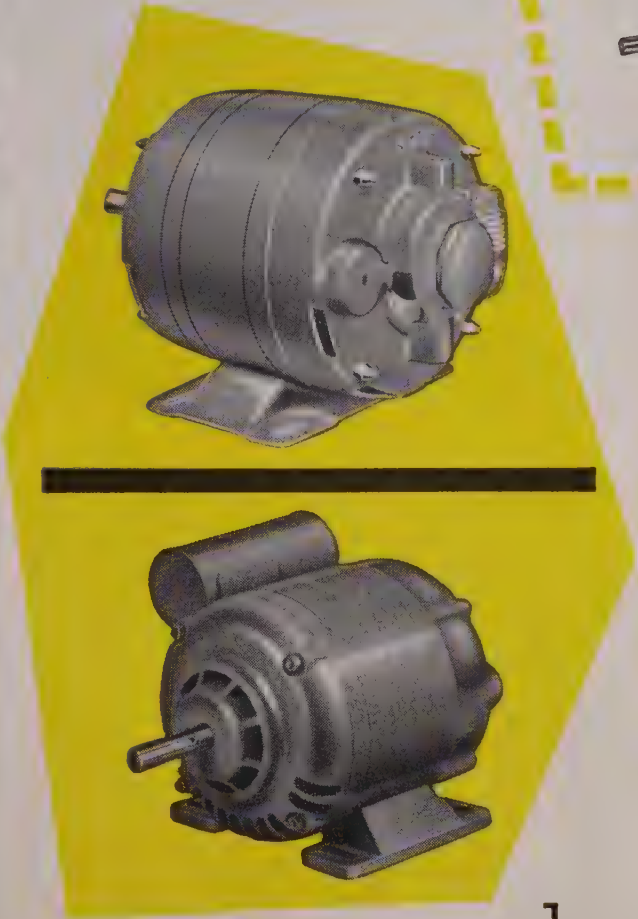

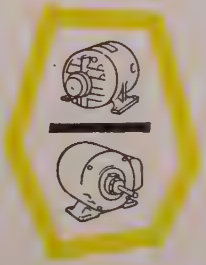

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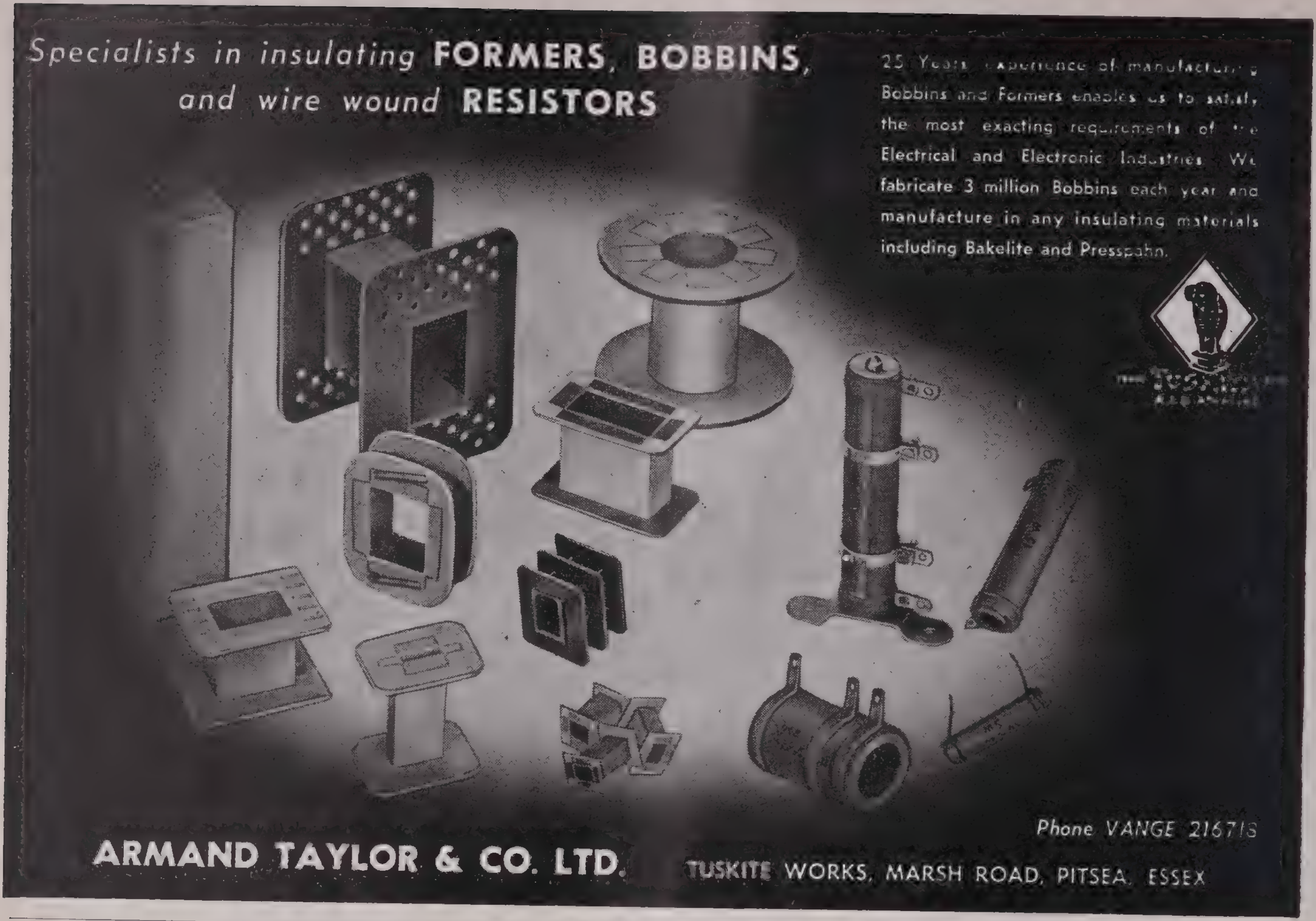
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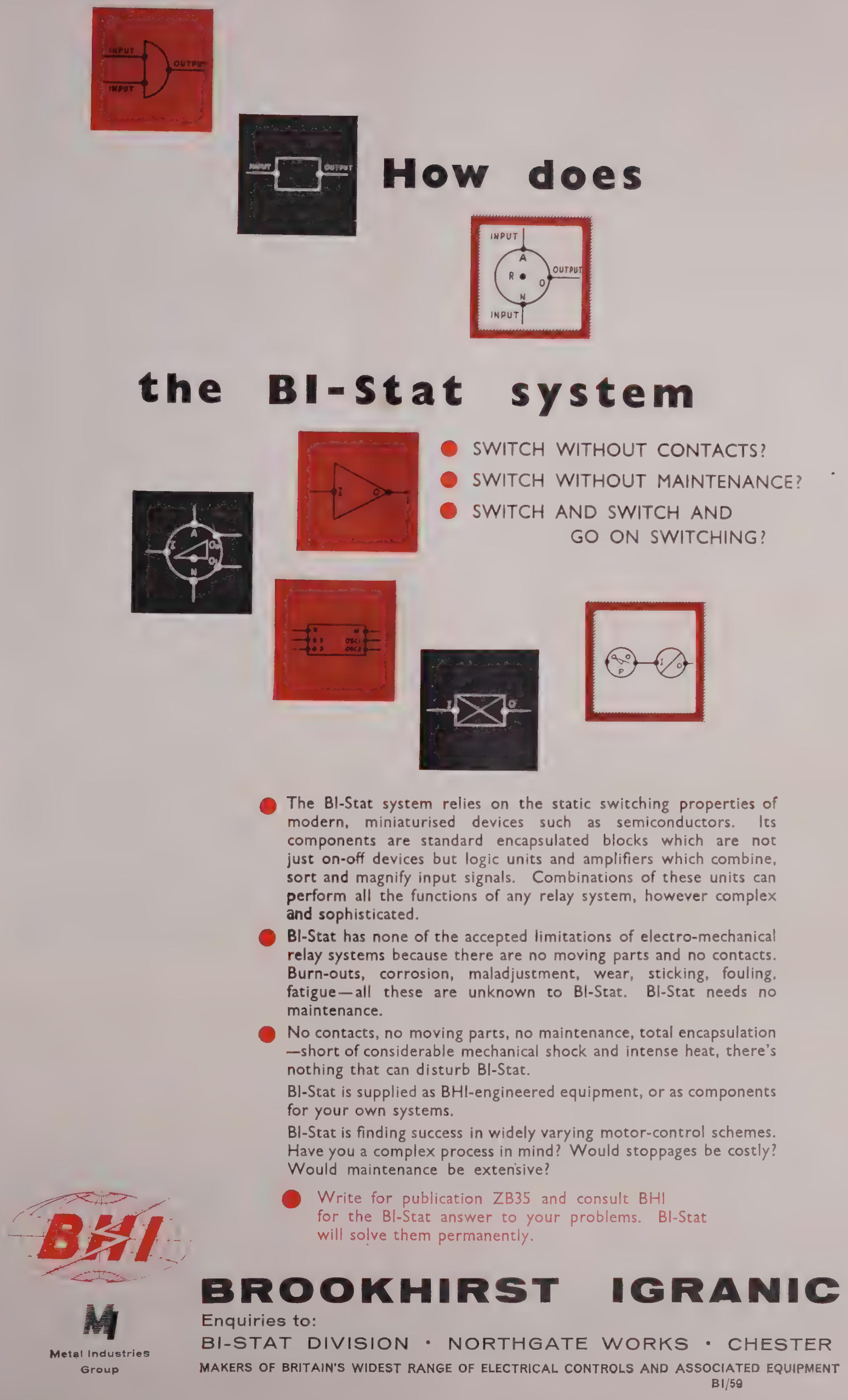

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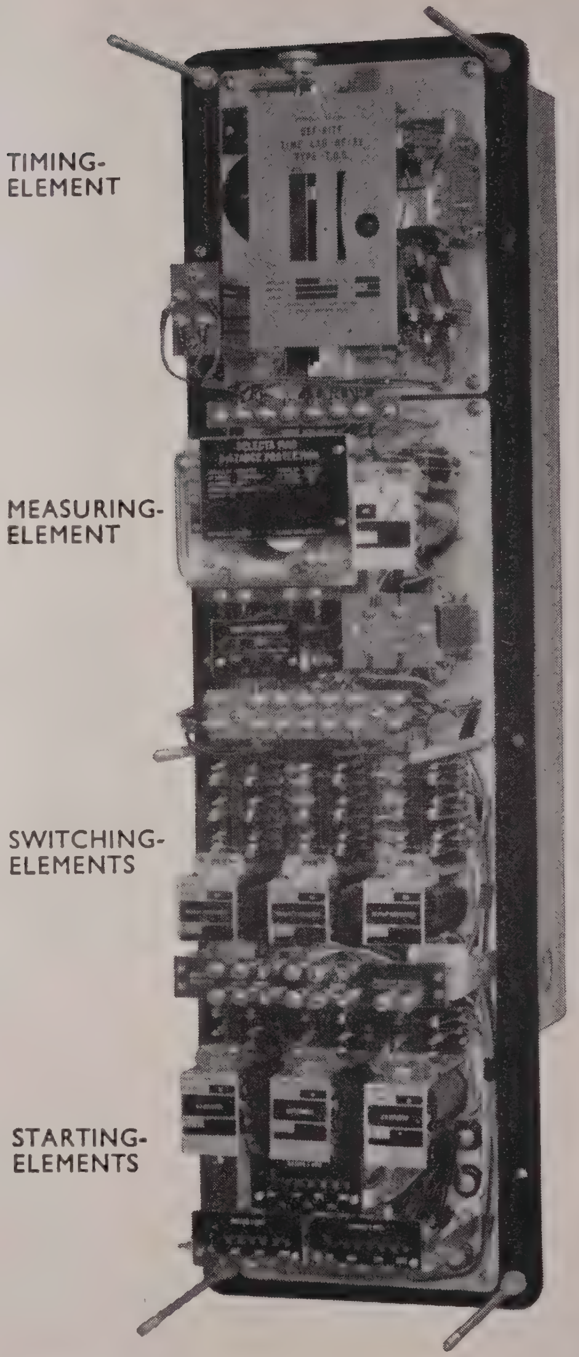

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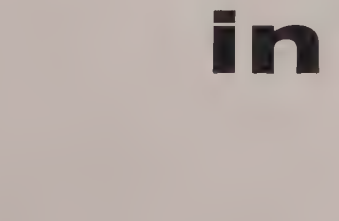

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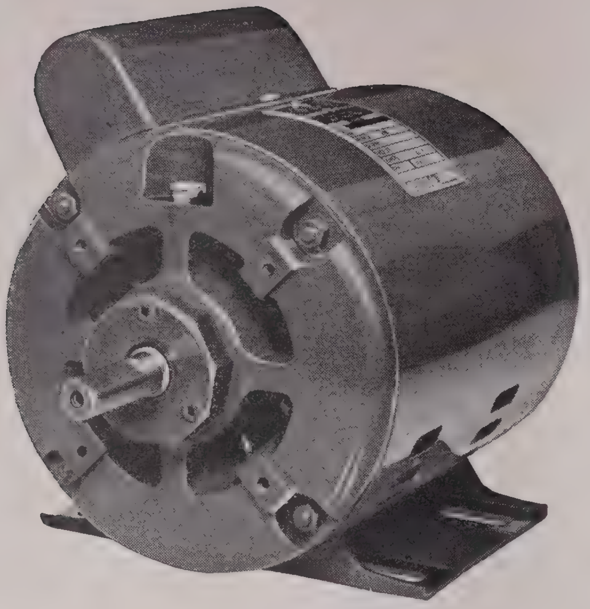

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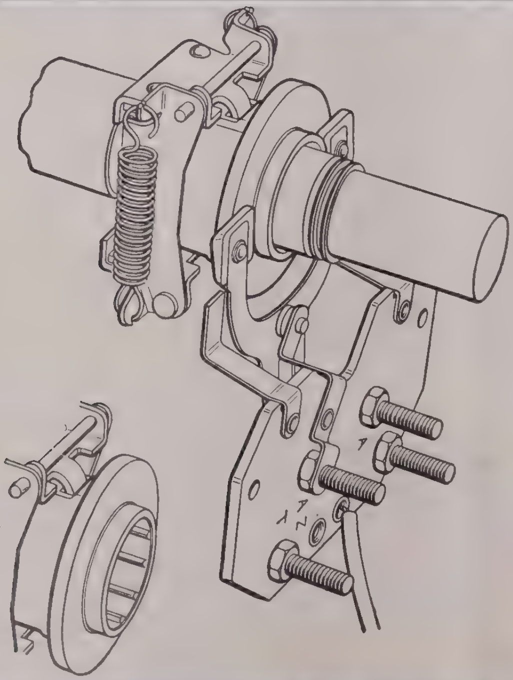

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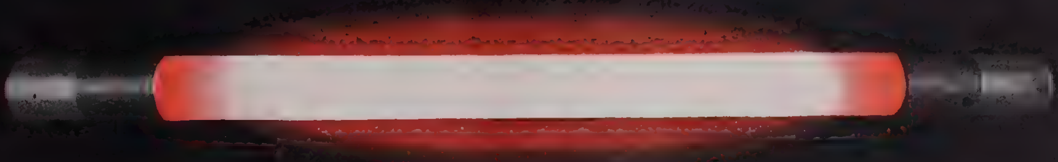

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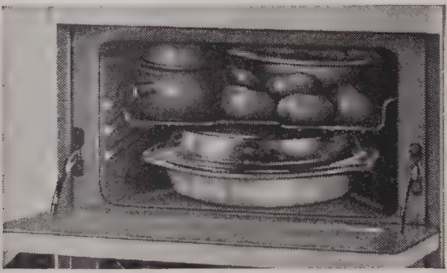

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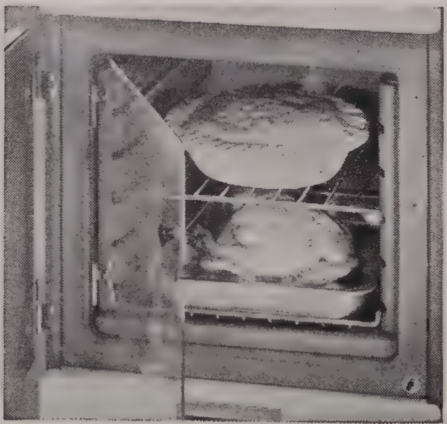

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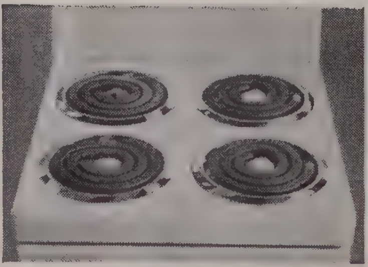

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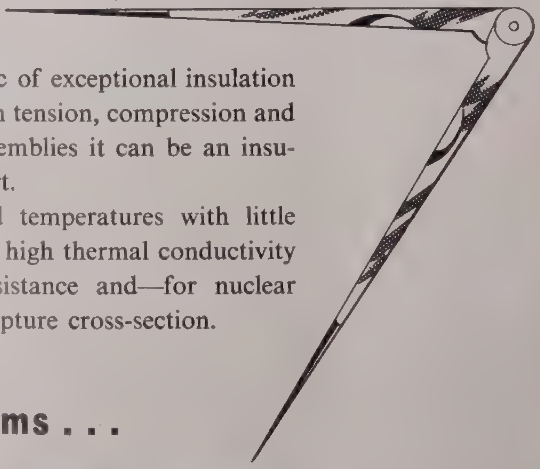

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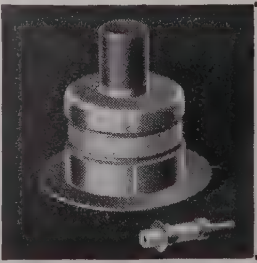

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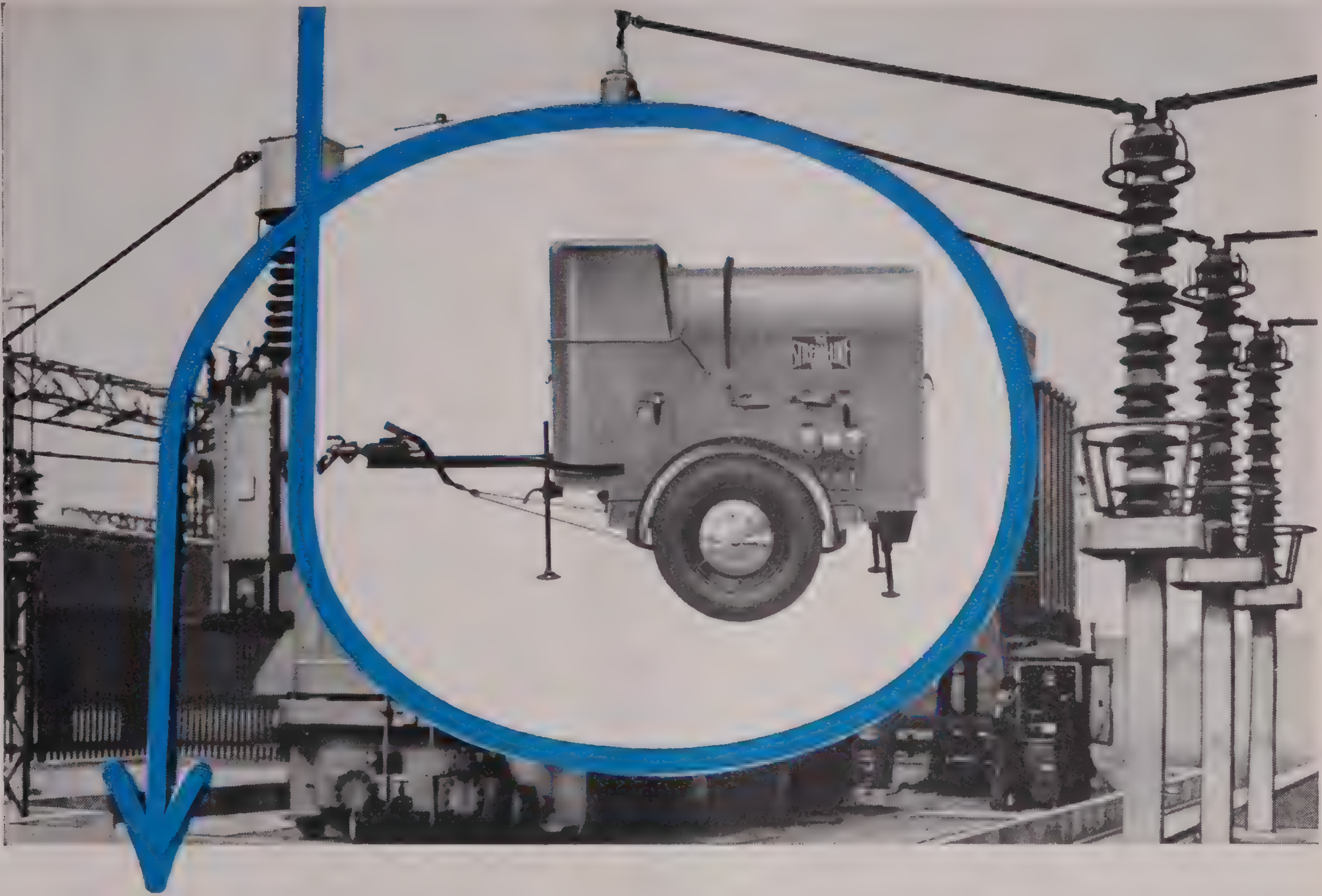
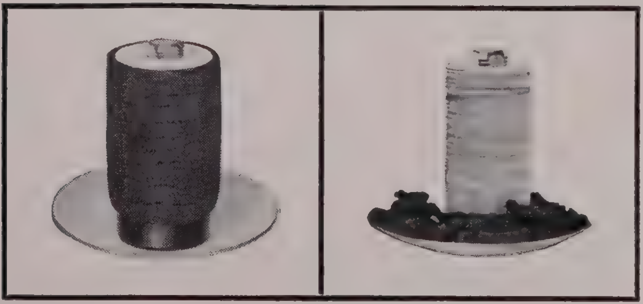


Loop in a Stream-Line filter



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Eighty-Ninth Year of Publication

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ELECTRICAL REVIEW

18 August 1961 Vol. 169 No. 7 Established 1872

Electronics in Medicine

JUST over a year ago the Third International Conference on Medical Electronics was held in London, and this event made it quite obvious then that the subject had arrived as a definite entity. The Fourth Conference was held this time in the splendour of the Waldorf Astoria in New York (16th-21st July). It closed its doors on the very day, as it happens, that one of the most highly instrumented men in history blasted off from Cape Canaveral for a short venture into space. The conference was organised by the International Federation of Medical Electronics in conjunction with the Institute of Radio Engineers, the American Institute of Electrical Engineers and the Instrument Society of America.

Any congress, however international in intent, when it is held in a highly developed country must acquire a flavour or an orientation which is basically that of the hosts. Most of the differences between last year's conference and the New York event can be attributed to this phenomenon. One of the most obvious differences was the much greater part which American industry plays in this new subject. Many of the papers were presented by members of commercial organisations who, while not completely eschewing the " sales potential " of a captive audience, nevertheless made a valuable contribution. Many firms have been introduced to the subject by the biological part of the space programme which has provided a tremendous stimulus, particularly in the field of the collection and transmission of physiological data from man and animals. These techniques are now becoming of importance for the continuous monitoring of hospital patients.

Another reason for the greater involvement of industry is the greater sales opportunities which the United States offers, both because money for sophisticated instrumentation is more freely available, and also because the thought climate favours such investment. It may not have been entirely sour grapes which prompted a remark from at least one European delegate to the effect that some of the more elaborate equipment was only used because it was there. Certainly, the use of computers and multichannel magnetic tape data recording systems is commonplace.

Some heat was generated on one or two occasions on the question of whether the title of the International Federation of Medical Electronics was an appropriate one. In the opinion of some the subject should be expanded both in title and in scope to include the application of engineering techniques in general to biological problems. Others thought that while the expansion of scope had taken or was taking place the emotional appeal of the word " medical " and the fashionable appeal of the word " electronics " should not be lost in the interest of public and financial relations. The etymologically unlovely compromise of " Biomedical Engineering " was proposed and is being considered.

The conference suffered from a malady which is a common complaint at most international conferences in that it was simply too big. To get through almost 300 papers, four sessions had to be run in parallel from 9 a.m. to 5 p.m., with organised discussion groups in the evenings. It is unfortunate than in many institutions an intending delegate can only obtain the money to attend a congress if he submits a paper which is accepted. The programme organisers must therefore always err on the side of unselectiveness.

Too little emphasis was placed on the desirability of scientific demonstrations or exhibits, which provide the best possible basis for discussion and, moreover, are not so fleeting as a ten-minute paper read in a lecture hall other than the one in which one is sitting at the time. There were only five of these demonstrations at the conference, including two from Britain. The conference was attended by a gratifying number of doctors, and it was thus certainly successful in providing a meeting ground between the engineer and the medical man.

SCOTTISH PUMPED STORAGE PLANT

The largest pumped storage scheme in the world is to be built in Scotland for the North of Scotland Hydro-Electric Board. The station will be situated underground in the heart of Ben Cruachan and will be the major generating station of the Loch Awe scheme which also has two conventional hydro-electric stations at Inverawe and Nant. The station will consist of four reversible pump/turbines with four 100 MW motor/generators. This equipment is the first of its kind to be manufactured in this country; instead of a separate pump coupled to the same shaft as the power producing turbine as at Ffestiniog, a single stage combined pump/turbine will be used. By this means economy in cost and space will be achieved.

At night and at week-ends when the demand for electricity is less water will be pumped from Loch Awe to a reservoir formed by a dam with a crest over 1,300ft above sea level, which will be built across a corrie on Ben Cruachan at the head of Cruachan Burn. This will be the first single-stage reversible pump/turbine to be operated under a head of more than 1,000ft and a number of novel features are incorporated in the design.

LOW-TEMPERATURE HEATERS

Next week's issue of the *Electrical Review* will include a self-contained detachable supplement surveying domestic low-temperature heaters—convector radiators, panel heaters, fan heaters, etc. Dimensions, element loading, price and purchase tax, including the recent surcharge, will be given.

ENTERPRISE REWARDED

Financially the electrical industry has been going through a rather trying period but the papers at this year's Power Convention showed that there need be no doubt about the long-term prospects for the industry as a whole. The performance of individual firms is, however, harder to forecast, especially against the background of recent results. Yet the picture is not uniformly gloomy. Despite the difficult trading conditions on the domestic appliance side, the Thorn Electrical Industries Group substantially increased its trading profit last year and Mr. Jules Thorn is confident of the group's continuing ability to give a good account of itself.

A major factor in this excellent result was apparently the contribution of the lighting division which achieved a record turnover and profit. Solid progress was also made with cookers. On the radio and television side the group's share of a lower level of business was increased by " re-organisation of production capacity and energetic measures in the commercial field." Absorption of many well-known brands has made Thorn the largest group in the radio and television industry. It is encouraging to learn that this position of strength is being used for a vigorous promotion of exports. Receivers specially designed for European markets have proved successful; lighting, refrigerators and cookers also figure prominently in the board's plans for increased exports, while overseas manufacture is being expanded.

ELECTRICAL EMPLOYMENT

There is a prevalent impression that the electrical industry is in a " trough." Reports that employees are being stood off are given prominence, but the latest figures published in the *Ministry of Labour Gazette* point in the opposite direction. These figures relate to the end of May and they show that in the electrical machinery branch there were about 10,000 more people employed than at the end of May last year. Similarly, increases in the numbers employed are indicated for the cable-making industry and the telegraph and telephone apparatus section.

Even in domestic appliance production, which is believed to have been depressed by prevailing conditions, there were actually more employed. Only in " radio and other electronic apparatus " was there a decline and this must have been on the radio rather than the " other electronic " side.

Medical Electronics Conference

Three hundred scientific papers, six organised discussion groups, five scientific exhibits and sixty commercial exhibits made up the Fourth International Conference on Medical Electronics held in New York from 16th to 21st July. The conference had a truly international flavour with two hundred delegates representing twenty countries

By H. S. WOLFF

FROM the scientific point of view, Britain was well represented at the International Conference on Medical Electronics in New York also taking pride of place with two out of the five scientific exhibits. This was unfortunately not matched on the commercial side where there was an almost complete failure on the part of British industry to participate. One notable exception was an impressive display by Fairbanks Morse of E.M.I. closed-circuit colour and black-and-white television equipment. The colour equipment, using a Cintel large screen projection receiver, is intended for the teaching of surgery directly from the operating theatre. The colour fidelity is alleged to be superior to any American system.

Eleven Japanese firms exhibited on a joint stand under the ægis of the Electronic Industries Association of Japan. There were also exhibits from Italy, Denmark and Western Germany.

Space medicine has had the most profound influence on the industrial progress of medical electronics in the United States. The effect has been two-fold; it has not only provided finance on a lavish scale for the development of special miniaturised equipment but has also stimulated firms without any previous medical connections to enter the field. The result has been a rash of sub-miniature f.m. transmitter systems which are intended to be worn on the person. These transmitters can be modulated from a variety of transducers, usually sensing temperatures, mechanical movement such as respiration, and the electrocardiogram. The range can be up to a few hundred feet, without any external aerial on the transmitter; typical dimensions for a three-channel model containing its own power supply would be 4¼in by 2¼in by 2¼in. The price, by British standards, is fantastic (about £300 for this unit alone without transducers).

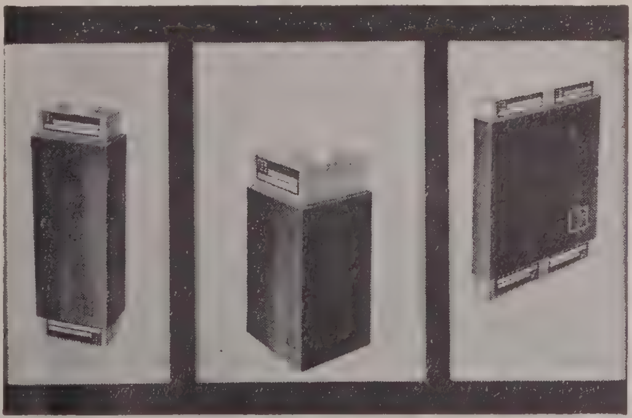
The construction of these devices is elegant, though small size has been achieved only by the application of sophisticated methods of miniaturisation to standard circuitry. Some British work in this field has made a different approach in so far as an attempt has been made to design transducer and transmitter to be integral parts of one another with the result that the conventional amplifying and modulating stages may no longer be needed.

The hoped-for large-scale application for these data acquisition systems is in hospitals for continuous patient monitoring and, to a smaller extent, for diagnostic purposes when measurements can be made on a patient whilst exercising, for instance.

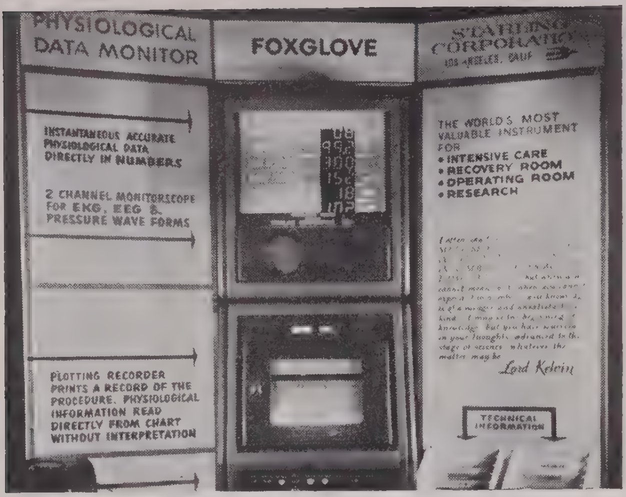
Patient monitoring would initially be applied, and wired versions are already in use for this purpose, for the observation of a number of patients requiring intensive care, from a central point. Both digital and graphical display consoles have been developed by a number of firms; these can have built-in limit alarms which are triggered when a given physiological variable, like the blood pressure or heart rate, strays outside permissible limits. It is said that the high cost of these systems can be recovered in two years in terms of savings in nursing staff, the cost of which is very high in the United States.

There are also proposals to mechanise the issue of patients' drugs. Investigation has shown that the majority of hospital prescriptions can be filled by one of forty drugs. These would be stored in the ward, in single doses, in slot-machine-like dispensers. The doctor would prepare a prescription on the ward which would be in the form of a check list on which the drug, dose, patient's code and time of administration would be marked. This would be sent to a control computer which would compare the doctor's instructions with built-in figures for safe dosages, etc. At the right time, a light would flash on the appropriate drug dispenser and, by means of a key, the nurse could extract a single dose attached to a card bearing the patient's code. She would take the card to the patient, compare the coding on the card with a code slip worn around the patient's wrist, administer the drug, and return the card to the computer to show that the operation had been completed. Apart from reducing the chance of mistakes, it is claimed that much valuable statistical data could be obtained and that a check could be kept on cumulative doses.

Electronic aids to diagnosis can be divided roughly into two categories: the first, those which serve as an extension



Three-channel f.m. telemetry transmitter (Litton Systems, Inc., U.S.A.)


PHYSIOLOGICAL DATA MONITOR
FOXGLOVE
STARLING CORPORATION LOS ANGELES, CALIF.
INSTANTANEOUS ACCURATE PHYSIOLOGICAL DATA DIRECTLY IN NUMBERS
2 CHANNEL MONITORSCOPE FOR EKG, EEG & PRESSURE WAVE FORMS
PLOTTING RECORDER PRINTS A RECORD OF THE PROCEDURE. PHYSIOLOGICAL INFORMATION READ DIRECTLY FROM CHART WITHOUT INTERPRETATION
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Lord Kelvin
TECHNICAL INFORMATION

Patient monitor providing digital and graphical readout (Starling Corporation, U.S.A.)

of the doctor's senses, or his patience, if the investigation is a tedious one, and the second as an extension of his memory and his knowledge. One interesting device in the former category is an automatic machine for the recognition of abnormal blood cells on a blood film. It is thought that one of the most sensitive indices of minor radiation damage is the appearance of an abnormal white cell in the bloodstream called a binucleate lymphocyte. Unfortunately, the concentration of these abnormal cells amongst normal cells is so low as to make a visual microscopic search unprofitable. In the Cellscan system under development by the Perkin Elmer Corporation, the microscope field is viewed by a television videcon camera. The scan information is fed into a specialised computer which basically is capable of measuring the size of opaque inclusions within cells in addition to counting them. The size distribution of inclusions in normal and abnormal cells is different, and it is possible that identification can be carried out on this basis.

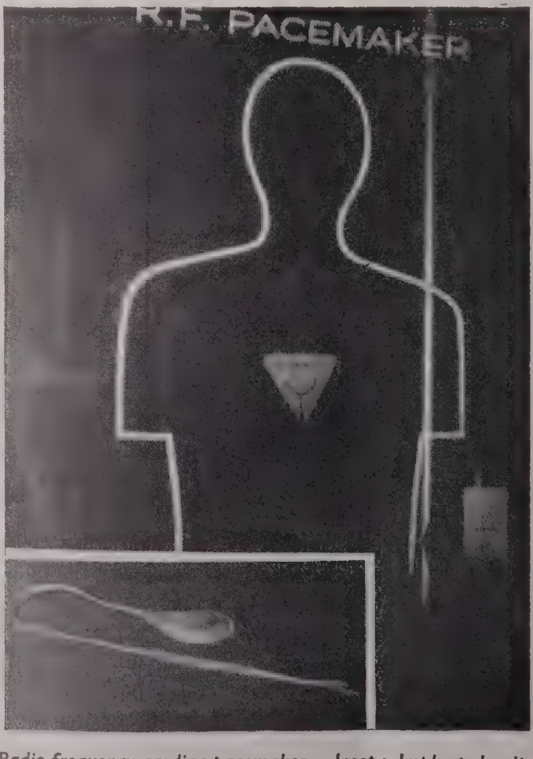
Information on Symptoms

Conventional computer memories can store all available symptomatic information about a given group of diseases. They can thus act as super textbooks in relating a certain set of symptoms, as observed by the doctor and laboratory findings, to an obscure disease. If, furthermore, experience is fed back into the computer it will learn to weigh symptoms as to their relevance in various combinations. One computer programme has now been completed in which about 1,000 symptoms are related to 100 blood diseases.

Because of the high cost of a computer, such a service would have to be highly centralised, with possible attendant disadvantages. A simpler solution, proposed by Dr. Zworykin, would use the following system. Film transparencies are prepared for each disease, which carry a number of transverse lines like a set of spectral lines, the position of each line defining a symptom, and its intensity the weight to be attached to that particular symptom. Similar transparencies are prepared showing the actual findings on the patient. A relatively simple machine then successively superimposes the patient's spectrum on all the standards and measures the light transmitted by the combination. The transmitted light will be at a maximum when all lines are in exact register. The output of the machine is in the form of another card which lists the 12 most probable diseases, that is, those combinations giving the highest light transmission, together with a figure indicating percentage transmission. This instrument, it is claimed, is sufficiently cheap to be available to the individual doctor.

Two instruments were shown which are intended to produce electrical impulses capable of stimulating muscular contraction if, for one reason or another, the nervous pathway leading to the muscle is interrupted. The first is a cardiac pacemaker, that is, it is intended to replace synchronising pulses normally produced by a biological pulse generator inside the heart. The application is not new, but this solution appears particularly advantageous. A flat coil is mounted during surgery on the inside of the chest wall, together with a silicon diode and two wires leading to the heart muscle. The assembly is potted in silicone rubber. The wires are multi-stranded and made of a special alloy which will not corrode and has a high resistance to fatigue fracture. A similar but rather larger coil is mounted on the outside of the chest wall concentric with the pick-up coil. This transmitting coil is fed from a self-contained source of pulsed radio-frequency. The r.f. pulses are induced in the pick-up coil, rectified by the diode, and the d.c. pulse stimulates the heart muscle. The pulse generator, and batteries sufficient for three weeks, are contained in a unit measuring 4½in by 3in by 1in. The pulse amplitude and frequency is under the patient's control so that he can adjust the output of his heart to suit his rate of exercise.

The second instrument is a stimulator for limb muscles which are paralysed because their nervous connection has been interrupted. Electrodes are placed by the doctor at suitable points on the skin above the affected muscle and connected to a transistorised unit capable of producing



Radio frequency cardiac pacemaker. Inset: Implanted unit (Electro-Age Corporation, U.S.A.)

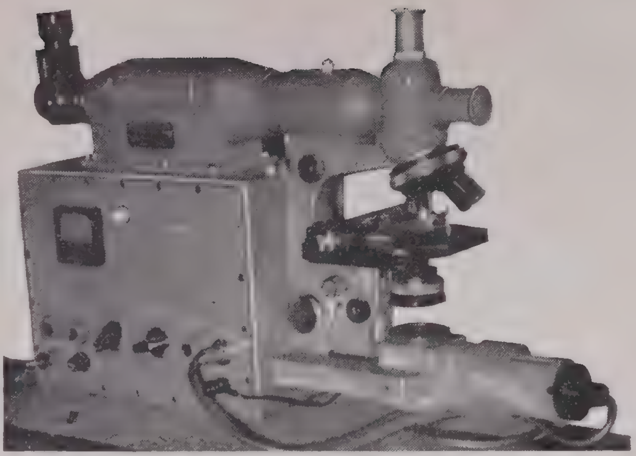
pulses with a very fast rise time. The fast rise time has been shown to minimise the sensation of pain generally associated with electric shock. The pulse generator is triggered to produce a burst of pulses by a switch mounted on another limb; this may be a mercury switch so that motion of a sound limb may produce a corresponding motion, with or without a delay, in the affected limb. Some semblance of normal walking could thus be produced with the sound leg stimulating the paralysed leg after a suitable delay. A switch might also be mounted in the heel of the shoe on the paralysed side so that pressure on the heel transmitted from the hip would produce a forward swing of the leg.

Almost a corollary to this last instrument is an attempt which is being made both in the U.S.A. and in this country to use the electrical nerve impulses still present in the stump of an amputated limb to control the operation of an artificial limb. Studies are being carried out to relate the magnitude and surface distribution of these potentials (e.m.g.) to the motion normally produced. Another application of this research is to use the e.m.g. of the intact limb for the actuation of servo-controls in, for instance, high performance aircraft where the pilot's own ability to move his limbs may be severely limited because of g forces.

New Radiography Technique

The technique of the electronic flash as applied to visible light photography has now been applied to medical radiography. X-ray tubes have been made which, instead of using a heated cathode which can be operated only at a limited current density, use a cold sharply pointed metal needle from which, due to the phenomenon of field emission, very high currents can be drawn. By using pulse techniques it is thus possible to produce very high intensity, very short, X-ray flashes. There are two main advantages. The first is that the power supply equipment can be small and light, and self-contained, and therefore truly portable. The present unit, described by the Field Emission Corporation, weighs 80 lb and is the size of an average suitcase. The second advantage is that because of the short exposure the small shielded tube can be hand-held and blurring due to movement of the patient is also avoided.

Limb muscle stimulator (Heinicke Instruments Co., U.S.A.)



Infra-red microscope (Nippon Electric Co., Ltd., Japan)

Another device using non-visible radiations was a Japanese infra-red microscope in which the visible image was produced by the use of an image-convertor tube. Tissue is more transparent to infra-red than to visible light, so that it is possible by means of this instrument to distinguish detail inside cells not seen previously.

An infra-red image convertor was also used in another instrument designed to obtain information about the state of the inside of the eye when the cornea had become non-transparent. Infra-red radiation can penetrate the opacity. This enables the eye surgeon to decide whether the retina of the eye is in sufficiently good condition to make a corneal graft worth while.

Radio Pills

One session of the conference was devoted largely to radio pills (sub-miniature radio transmitters which can be swallowed). One paper dealt with a pill tracking device which draws a two-dimensional map of the progress of the pill on to a curved chart fixed over the subject's abdomen. The radio pill is tracked by a small omni-directional aerial which moves along a circular path parallel to the surface of the abdomen. Two servo-motors, one for the head-feet direction and one for the left-to-right movement, position the aerial in such a way as to make the signal strength over the whole of its circular path substantially uniform. The axis of rotation of the aerial must then pass through the pill. The pen is attached to the aerial carriage. Whilst this method still only fixes the position of the pill in space, rather than identifying the portion of the gut in which it is situated, the pattern of motion taken together with the telemetered readings of the transducer in the pill will make the latter much more valuable.

Another paper described a high resolution and very stable temperature-sensitive radio pill containing a novel transducer. This takes the form of a toroidal inductance with a strip-wound core made from a nickel-iron alloy known as Mutemp HTC. The permeability of this material decreases rapidly between 10 and 40°C so that the inductance has a temperature coefficient of −7 per cent/°C over the body temperature range. In the pill, it is used as the tuning inductance producing a frequency deviation of 10 kc/s/°C at a working frequency of 350 kc/s, with a long-term stability of better than 0·1°C.

The continuous measurement of oxygen concentration in gases is of practical significance not only in medicine but also in aeronautics and in space vehicles. One group of workers has adapted the principle of the hydrogen/oxygen fuel cell for the measurement of oxygen partial pressure. One half of the cell is supplied with hydrogen in the usual way, whilst the other half is separated from the environment by an oxygen permeable membrane which offers a resistance to the diffusion of oxygen so that the amount of oxygen available to the cell is proportional to partial pressure. The voltage output of the cell into a high resistance is then a direct function of the oxygen partial pressure. Because of the small current which is taken out of the system the fuel cell can be quite small and only requires a nominal amount of hydrogen.

That, in this age of electronics, evolution would sooner or later have to catch up and equip humanity with sense organs sensitive to electrical variables has always been hoped. Now one group of workers claims that they have demonstrated that the human auditory system is sensitive to modulated radio-frequency energy in the range 200 to 3,000 Mc/s. The energy, which is well below that required to produce biological damage, is perceived by the subject as a knocking or buzzing sound a short distance behind the head. Control experiments have shown that the effect is not due to rectifying contacts between fillings in the teeth, that perception is located in the upper half of the head, and that a functional ear-drum is not essential!

British Exhibits

Of the two British exhibits one was contributed by the Royal Air Force. Wing Commander J. E. Malcolm showed an analogue model of the heart and the circulation which, amongst other factors, generated realistic pulse sounds by the motion of the blood itself and allowed the stresses put upon the vascular system to be demonstrated.

The Biological Engineering Society provided the other exhibit. This was intended, within the limitations of air freight, to give a survey of the activities of its members in universities and research institutions. Instruments shown ranged from high power ultrasonic transducers for the destruction of nervous tissue in surgery, through radio pills and accessories, to the control of artificial muscles by potentials present in the stump of an amputated limb.

FUELLING REACTORS ON POWER

EXPERIMENTS have been carried out in the Calder Hall reactors to find out what happens when fuel elements are loaded into a reactor on full power. The C.E.G.B. civil power stations have been designed to allow fuel replacement while the reactors are running continuously and the Calder experiments were to check that the fuel elements would withstand the temperature changes involved.

The Calder reactors were designed for complete fuel changing with the reactors shut down and depressurised. For these tests, therefore, it was necessary to adapt existing charge and discharge equipment to provide on-power fuelling conditions. The element to be tested was suspended from a spare control rod mechanism modified to give the required speed of insertion and to hold the element in the required position in the reactor. The gas flow through the channel was adjusted so that the test element, by virtue of its own heat production and that of the other elements already in the channel, would experience the required temperature changes. This simulated the actual civil station loading conditions where it is expected that the elements (perhaps after some preheating in the charge machine) will be subjected to a further rapid increase in temperature when inserted into the core.

On completion of the experiments, the irradiated elements were sent to the laboratories for metallurgical and radiographic examination by remote handling. These tests revealed no significant effects on the elements as a result of on-load charging. A second experiment was carried out to see what effects frequent variations in temperature—thermal cycling—had on fuel elements. The elements already in a civil reactor would be subject to these changes every time an adjacent channel was charged or discharged. To simulate these changes, two control rods were oscillated up and down in the reactor core to produce temperature variations in the neighbouring channels. The oscillations were continued for about 13,000 cycles and the nearby fuel elements then discharged and examined. Here also no measurable ill-effects were found.

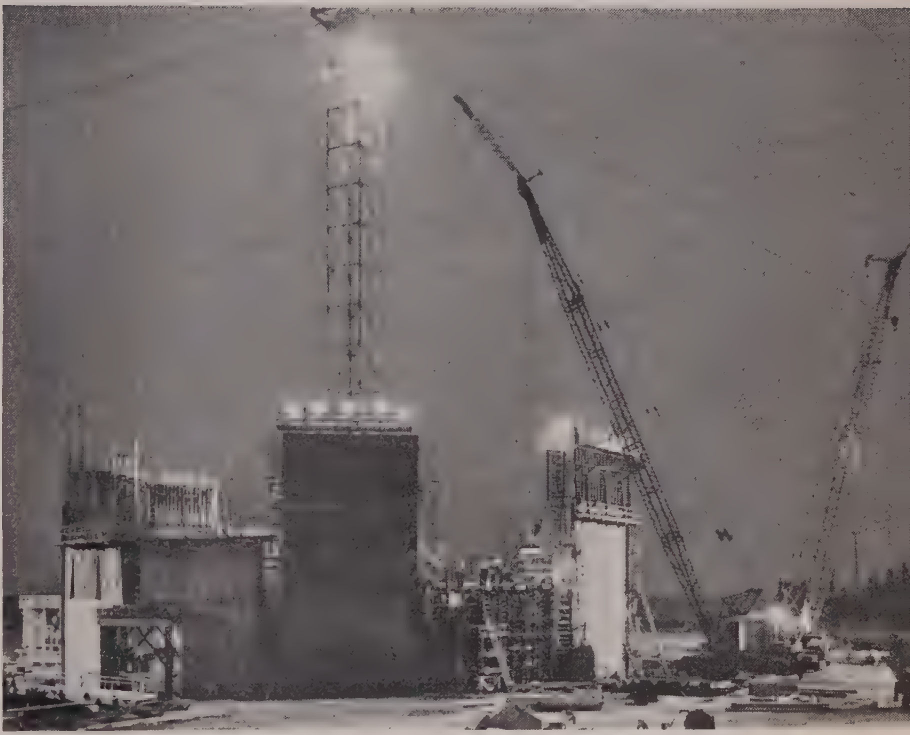
Exciter Lamps

FIRST issued in 1942, the British Standard B.S. 1015 "Exciter Lamps" has now been revised. The range of lamps has been extended to meet the current requirements of the manufacturers of 16 mm as well as 35 mm projectors, while some of the lamps in the previous edition, now no longer in current use, have been omitted. The standard covers both dimensions and optical performance. The lamps specified include types with bayonet caps and prefocus caps, with bulbs of pear and tubular shapes, and with transverse and axial filaments. In addition to the general overall dimensions of the lamps, the approximate dimensions of the filaments are now given and the requirements relating to the position of the filament when burning have been clarified and amplified. Values are specified for initial light output and current consumption, minimum lumen output maintenance, and hours life, and a detailed procedure is given for the sampling and batch testing of the lamps.

Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 5s each.

Canada's Nuclear Future

Two nuclear power plants using natural uranium fuel and heavy water moderation are under way in Canada. A Parliamentary Committee inquiring into the subject of nuclear power has approved this system but suggests that other methods should be studied. It has also made recommendations on a number of related points



A night view of the CANDU reactor building now being constructed at Douglas Point on Lake Huron, 130 miles from Toronto

PARLIAMENTARY COMMITTEE'S RECOMMENDATIONS

By R. C. GOLDING, M.Sc.(Eng.)

DURING recent months, Canada's policy of nuclear research and development has been the subject of investigation by a Special Committee on Research, appointed by the Canadian Parliament. This is the third such investigation that has taken place, the first two committees having reported their findings to Parliament in 1952 and 1956. In each of these two instances, the investigation was a formality; in 1960-61 this has been anything but the case. Indeed the whole situation was once the object of Canada's National Film Board, prospecting for likely material for a film. In the words of the prospective producer, " the whole subject gave off more heat than light!"

Atomic Energy of Canada, Ltd., the Government-instituted agency charged with the task of keeping Canada's head to the fore in the realm of nuclear research, was set up by the Liberal Government in 1952. It has a complete monopoly so far as nuclear activities relating to power generation are concerned. The only private companies engaged in this field are employed by A.E.C.L. to carry out investigation or development, or are partners with the Crown company in the project of producing Canada's first major power reactor (CANDU).

As attention became concentrated on the peaceful uses of the atom at the end of the last war, both the United Kingdom and the United States went their separate ways. Canada became heir, more or less by chance, to the natural uranium, heavy water moderated approach to reactor development. This was the line of research which had been carried on in Montreal as a result of the tripartite activities emanating from the war period. It was the system about which Canada knew most, and was far from being an unpromising one technically. Thus the National Research Council, which later gave way to A.E.C.L., concentrated their efforts in this direction.

Canada is, of course, a uranium exporting nation, and this policy seemed to tie in with its mining activities. If a natural uranium reactor could be made economic, sales of these abroad would boost Canadian sales of natural uranium. It was not until later that the possibility of making even greater sales of fuel metal, by the use of other methods, was to become evident.

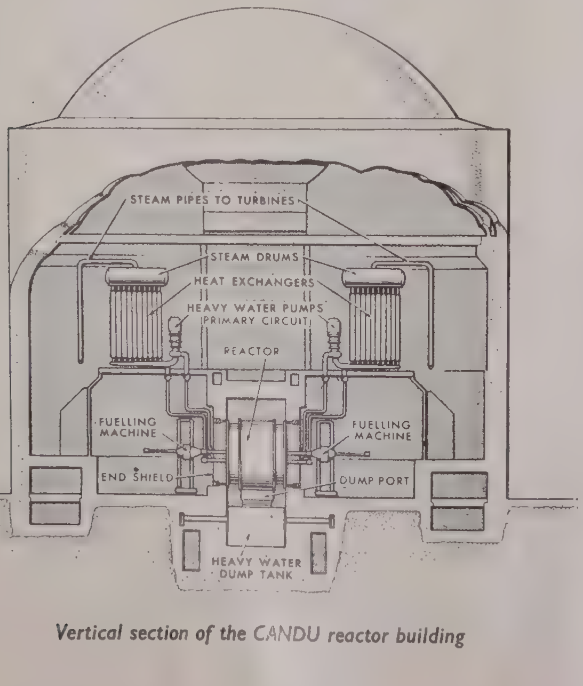
At the beginning of 1956, A.E.C.L., the Canadian General Electric Co., Ltd., and the Hydro-Electric Power Commission of Ontario joined forces in the project of designing and developing NPD (Nuclear Power Development), a 20 MW pilot plant now nearing completion at Rolphton, on the Ottawa River. This was chosen as it is physically near to the headquarters of A.E.C.L., at Chalk River, also on the Ottawa River. In about a couple of years, this project had made such progress that a full-scale development, CANDU, a 200 MW reactor, was started at Douglas Point, on Lake Huron. This site was chosen by Ontario Hydro as being suitable for the production and eventual distribution of a large block of electrical power.

Thus Canada was committed to the erection of two nuclear power plants, both using natural uranium fuel, with heavy water moderation. However, contrary to some expectations, although NPD was designed by private enterprise, CANDU was not. Instead, A.E.C.L. started a development section to carry out this project by means of its own facilities, a move which was to come in for some criticism later.

At this time, Canada appeared to be ripe for nuclear progress, and a number of companies started nuclear development departments. These, in the light of experience, eventually disbanded, the employees either transferring to the Government-sponsored projects, moving to other types of industry, or leaving the country, often to work on nuclear projects in the United States. This loss of skilled people, and the parallel concentration of the nuclear industry in Government hands, received much comment, particularly in house organs and such papers circulating among professional engineers and scientists.

It was about this time (October, 1959) that a professional engineer, Winnett Boyd, read a paper to the Engineering Institute of Canada in Ottawa. Mr. Boyd had headed a design and development team which was retained by Orenda Engines, Ltd., a subsidiary of A. V. Roe, Ltd., and produced the only privately-sponsored nuclear reactor design in Canada. In the paper Mr. Boyd made certain points, based on his own design experiences, which seemed to throw some doubt on the technical design of the Government-sponsored reactor. The issue had now been joined, and the discussion on Canada's nuclear policy still goes on. It appears unlikely that even the report of the Parliamentary Committee, favourable as it was to the ideas of those who advocated a "new look" at existing policies, will stop it at this time.

Until the reading of Mr. Boyd's paper, probably few, if any, had ventured to question the operational possibilities of the heavy water reactor. However, there had been some doubts cast in public on the economics of the new reactor, and on certain administrative problems which were appearing in industry as a result of the Government monopoly in nuclear development. Indeed, it is probably true to say that to this day none challenges the technical design of this reactor on the grounds of physics or engineering but, as will be seen later, the technical design and economics have become so involved that it is no longer possible to keep them apart.



Vertical section of the CANDU reactor building

In view of Canada's position as a country with a great deal of water resources still undeveloped, the economics of nuclear generation have always been of paramount importance. The terms under which the three contributing partners to nuclear development became associated were that, when the operating costs of the new reactor had been established, Ontario Hydro would buy the plant. The price would be dependent upon the fact that energy produced would have to cost no more than production from a conventional steam electric plant. Heavy water plants normally have a low fuel cost because of the use of natural uranium, but because of their size and the cost of the heavy water involved the capital cost is high and this becomes the critical feature. If the capital cost is reasonable, the Canadian Government will be called upon to shoulder only a small proportion of the development charges. A high capital cost, however, could mean that a heavy burden would have to be borne by the taxpayer when the take-over date by Ontario Hydro arrived.

Charge and countercharge relating to the realism of the Canadian estimates for operating cost have been sharp and prolonged, to say the least. Ontario Hydro, in the first instance, laid down a parameter of 5 mils per kWh (0·5 cent) at which they felt it would be economic to purchase the plant at cost price. With the passage of time, and the increase in prices, the designers now expect the cost to be no less than 6·9 mils. The difference between the capitalised value of this figure and 5 mils is the price the Government would have to meet. (Extreme care should be observed in comparing Canadian estimates with those for United Kingdom plants.)

However, at a Canadian nuclear convention held while the Parliamentary investigation was in progress, George White, head of the General Electric atomic projects in California, spoke on the preliminary costs of the Dresden (boiling water) reactor outside Chicago. Based on their experience at this plant, Mr. White estimated that a boiling water, enriched uranium power plant, built in Canada with Canadian capital charges, could produce power for 4·58 mils per kWh.

Safety Factor Decisions

All these factors were laid before the Parliamentary Committee. A particularly interesting feature was the discussion on safety factors as applied to the official Canadian nuclear designs. Such designs should conform to the Unfired Pressure Vessels Act of the Province of Ontario. Since the NPD and CANDU reactors are both pressure tube reactors (fuel located and coolant circulating through horizontal zirconium tubes 13½ft and 17ft long respectively) it was noted in evidence that the designers had been able to make the reactors reasonably economic only by reducing the tube factor of safety from 4 to 3. This had been done in consultation with the boiler inspector (the appropriate official) but without reference to the American Society of Mechanical Engineers, as called for in the Act for special cases. This action had been taken by the boiler inspector under a clause of a local Act, which had never before been invoked since it was passed. The implications of this action were never ascertained by the Committee. However, any action tending to restore the safety factor to 4 in future designs can only militate against the production cost figure by reducing neutron economy.

It has always been an argument in favour of the Canadian design that no costs were involved in enriching the fuel. Against this there must be offset the cost of buying or manufacturing heavy water. In the estimates submitted by the Crown company for their own design, there was shown the cost of providing these alternative facilities until 1975. The result was a balance in favour of the heavy water design. Critics showed, however, that by continuing the estimates for a further five years, until 1980, there was a swing over in favour of lower costs for enriched fuel. The implication thus was that a policy devoted to the development of enriched uranium reactors, without heavy water, would be more economic for Canada.

Other aspects of nuclear policy which were examined were the disposal of waste, on which the Committee had some recommendations to make, and the organisation of construction projects abroad, such as the Canada India Reactor, about which comments had been made in the past.

Committee's Conclusions

In brief, the Committee recommended as follows:—

1. That the present policy of developing a heavy water reactor should be continued to ensure as speedy a conclusion as possible on the NPD and CANDU designs.

2. That in future nuclear construction jobs abroad, closer attention should be paid to the areas of respective authority and administration.

3. The work of the Commercial Products Division of A.E.C.L. (isotope production, etc.) should be increased and developed; the equipment manufacturing activities could gradually be handed over to industry.

4. That increased research should be devoted to the biological effects of radiation, possibly in conjunction with universities.

5. Approval is given to the A.E.C.L.'s intention to retire from nuclear power plant construction after the completion of NPD and CANDU.

6. That a study should be made of all aspects of producing enriched uranium in Canada.

7. That a study should be made of the possibility of producing heavy water in Canada.

8. That the Government should co-operate with other bodies in studies of reactor types alternative to heavy water.

9. That increased attention should be devoted to studying the international aspects of radioactive waste disposal.

10. The Committee approved the practice of the Atomic Energy Control Board in insisting that all reactors be designed in accordance with recognised engineering standards and practices.

The last suggestion may be taken to imply that the Committee were in agreement that the reduction of the factor of safety of NPD (a prototype plant) might be approved, but that in any future design any reduction in safeguards was to be approved only after strict adherence to proper procedure laid down by the regulations.

Perhaps the greatest use of the new report lies in the aims it sets for future endeavour. Until now, with one policy alone existing to provide an interpretation of Canadian intentions in the peaceful atomic field, critics were able only to offer destructive criticism. As might have been expected the critics, being unorganised, had no set and common policy. From now on, however, Canada has a target, an aim, and the means of reaching that target provided the Government implements the report.

While the action of this Government (with a possible election impending), as with all Governments, is still in doubt, Canada should be able to take advantage of the new situation created, to move into fields which will bring her new recognition as a world force in peaceful uses of the atom.

Nuclear Power Costs in India

REFERENCE is made by Mr. R. C. Golding in the foregoing article to the Canada India Reactor. Canada and India have agreed to make a joint study of the cost of building a large-scale nuclear power station of Canadian design in India, according to a Press communiqué issued by the Atomic Energy Commission. The study, which is being made at India's request, will cost about $50,000 and will be completed by the end of the year. It will determine the overall cost of building the power station and the cost of the components supplied by India and other countries, including Canada. The materials will also include uranium fuel.

It is understood that Dr. Bhabha's department of atomic energy has been authorised to select a suitable site for the power station in the Punjab-Delhi-Rajasthan-U.P. area. This region is situated away from the coalfields and its hydro potential is limited. It is also one of the fastest-growing industrial areas in the country.

India will not take a decision on building the plant until the costs are known. The study will be made by a team of about ten Indian and Canadian engineers. The Canadian group will include engineers from Atomic Energy of Canada, Ltd., and the Montreal Engineering Co., Ltd. The plant, if built, will be almost identical to the one now being constructed near Kincardine, Ontario.

Scholarships for Training in Electrical Engineering

THE British Electrical and Allied Manufacturers' Association has just issued a revised edition of a booklet which provides up-to-date information about the large number of scholarships and other awards open to British students. The booklet is entitled " Scholarships and other Awards Available to British Students for Training in Electrical and Allied Engineering " and is available from the B.E.A.M.A. Information Services, 36, Kingsway, London, W.C.2, price 4s. It is divided into three sections. Part I lists scholarships open to non-graduates, chiefly those leading to a first-class degree in electrical engineering; Part II gives the post-graduate scholarships and research awards open to senior students for advanced work in electrical engineering and allied subjects; and Part III shows awards which permit study abroad for both graduate and non-graduate students.

ELECTRICAL MANUFACTURE IN EUROPE

Industrial Expansion

By O. E. HUHTAMO, Eng.Dipl.*

A DISTINCT trend towards industrialisation, mechanisation and a rising standard of living has been apparent in Finland for well over a century. A once predominantly agricultural country is gradually becoming an industrial society, and manufacturing is already the source of livelihood of the majority of the population. In the process, mechanisation is gaining ground in other trades and industries, especially in farming and forestry and in the home. The use of electricity and the electrical manufacturing industry have been important factors affecting this evolutionary process and the structure of Finnish society.

As Finland is one of the most sparsely populated countries in Europe—average total density 37·5 inhabitants per square mile and in Northern Finland only 10·3—electrification has for economic reasons spread more slowly than in more densely-populated countries. As a result of the great expansion in electrification since the last war, however, about 85 per cent of all households are now connected to the national grid. This increased coverage is reflected in the growth of electricity consumption from 1,200 million kWh in 1930 to 2,700 million kWh in 1938, 2,900 million kWh in 1948 and an estimated 9,005 million kWh in 1960. The 1960 total works out at 2,100 kWh per inhabitant.

The recent development of Finland's electrical manufacturing industry is illustrated in Table 1 and the corresponding figures for industry as a whole are given for comparison. It will be seen that the electrical industry has expanded markedly both in size and output and that the growth in production has been considerably greater than that of industry as a whole. Its significance in the economy lies in its role as an employer, as an important sub-contracting industry and as an exporter in its own right. From the point of view of national self-sufficiency it is also worth noting that the electrical industry is capable of satisfying over 60 per cent of the country's requirements for electrical goods, and the same percentage of its own requirements of the basic material, copper, is obtained from deposits in Finland.

Post-war development in the electrical manufacturing industry can be divided into two distinct periods. During the first, the period of war reparation deliveries, which ended in 1952, electrical machinery valued at \$9·8 million was sent to the Soviet Union. These deliveries included 1,141 transformers, more than 27,000 electric motors (plus about 25,000 motors incorporated in other equipment) and 1,000 mobile power stations. Cable products were delivered to a total value of \$12·9 million, including over 17,000 tons of bare copper wire and about 1,450 miles of power and control cable. Products of the radio industry were incorporated in ships sent to Russia. Deliveries on this scale obviously necessitated increasing production capacity in the fields concerned at the expense of other products since priority in raw materials, machines, etc., had to be given to the establishments engaged in war reparations work. With the approach of the final year, however, the situation gradually improved, other branches of the electrical industry were able to develop and the already expanded plants could begin exporting.

In the 1950's the electrical industry was able to turn its attention and energy to the requirements of free markets. There were also great tasks to be accomplished at home. The water power of Northern Finland awaited harnessing and power transmission lines were needed to bring the power to the southern part of the country. The electrification of farms and households in rural areas was a major undertaking that proceeded rapidly and provided a great deal of work. The radio industry benefited from the network of v.h.f. stations started in 1950 and the

Table I.—Development of the Finnish Electrical Industry, 1938-1959

Year	Number of persons employed	% of total industrial employment	Gross value of production in million Marks†	% of the gross value of the total industrial production	The volume of production, 1938=100	
					Electro-technical industry	Whole industry
1938	2,609	1·2	323	1·3	100	100
1948	8,828	3·3	7,030	2·5	305	133
1954	9,318	3·2	18,007	2·7	454	201
1955	10,745	3·5	20,449	2·7	527	223
1956	10,750	3·4	21,370	2·6	518	229
1957	10,135	3·3	22,310	2·4	527	235
1958	9,300	3·2	21,453	2·2	472	227
1959	10,120	3·2	27,033	2·5	568	247
1960*	11,623	3·8	33,706	2·7	690	281

* Preliminary data. † £1 = 900 marks

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* Head of Information Department, Association of Finnish Metal and Engineering Industries.

in Finland

Earlier this year Finland entered into relationship with the European Free Trade Association and on 1st July import duties on goods from member countries were, with certain exceptions, reduced by 30 per cent. The Finnish electrical industry has an output of about £30 million a year and is an increasingly important sector of the economy

beginning of television transmission five years later. The first coaxial cables were introduced into the telephone network, and automation of telephone communications was speeded up. The meter industry, which originated after the war, gradually established a position for itself, but the electronic industry proper has remained small.

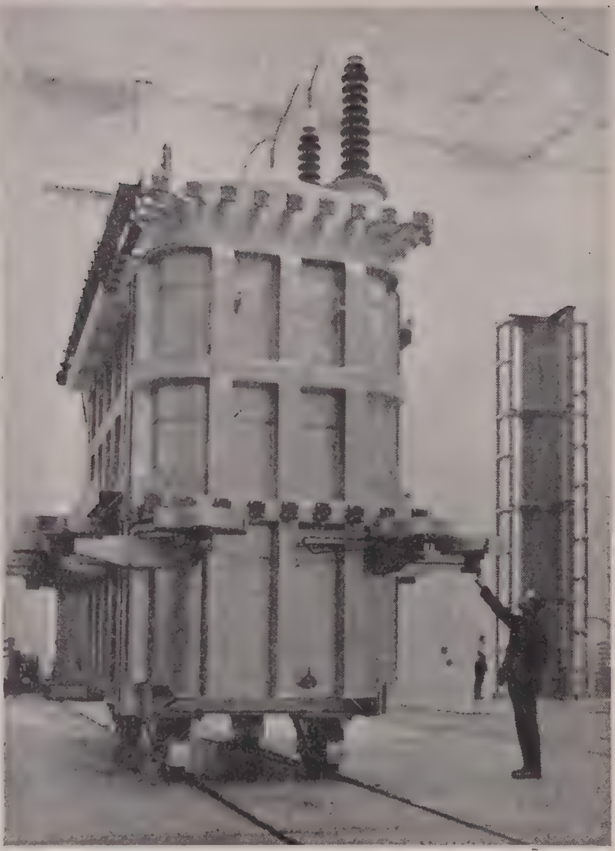
Table 3 shows that the main emphasis is on the production of cables, electrical machinery, power apparatus, incandescent lamps, batteries and radios.

The cable industry is technically competitive and has enjoyed a steady expansion of output. An important factor has been that at least in normal conditions it has obtained all the O.F.H.C. copper it needs from Finland. In addition to bare copper wires, steel-cored aluminium conductors are manufactured for both the home market and export. The industry also produces various power and telephone cables. The former now include oil-filled cables and the latter the coaxial cable needed in the automatisation of Finland's long-distance telephone network. There is also a production of capacitors. The industry is engaged in intensive research and development work and has drawn up firm plans for further expansion. The vigour of its progress is illustrated by the fact that in 1960 cable products were exported to 22 countries in the face of keen competition. The total value was 4,030 million marks or 34 per cent of production. (This sum includes bare copper wires (1,100 million marks) which for statistical reasons are excluded in other export figures.)

Electrical machinery produced in Finland ranges from

Table 2.—Imports and Exports of Electrical Machinery, Apparatus and Appliances

Year	Imports (million Marks)	Exports (million Marks)
1939	490	11
1949	3,235	164
1954	6,446	793
1955	7,309	744
1956	8,924	617
1957	9,593	1,104
1958	11,938	1,314
1959	14,645	3,137
1960	20,132	3,002



A 130 MVA, 120/10·5 kV transformer under test in the manufacturer's works (Oy Stromberg)

A 25 km length of submarine cable being coiled on the wharf as it leaves the armouring machine (Finnish Cable Works Co.)

Table 3.—Employment and Production of Selected Products

	Number of persons employed				Gross value of production (million Marks)	
	Wage earners		Total			
	1959	1960*	1959	1960*	1959	1960*
Insulated cables and wires	1,405	1,697	1,754	2,046	9,929	11,938
Electric lamps	345	—	478	—	572	—
Lighting fittings	388	—	478	—	914	—
Accumulators	69	—	90	—	314	—
Batteries	229	—	257	—	465	—
Transformers, generators and motors	2,614	3,136	3,866	4,388	5,126	7,102
Other heavy current apparatus	1,519	1,674	1,928	2,083	2,778	3,208
Radio and TV equipment	1,421	1,537	1,757	1,873	3,493	4,706
Other light current apparatus	547	714	703	870	1,185	1,531
Repair shops	1,583	—	1,826	—	2,258	—
Total	10,120	11,623	13,137	14,937	27,033	33,706

* Preliminary data.

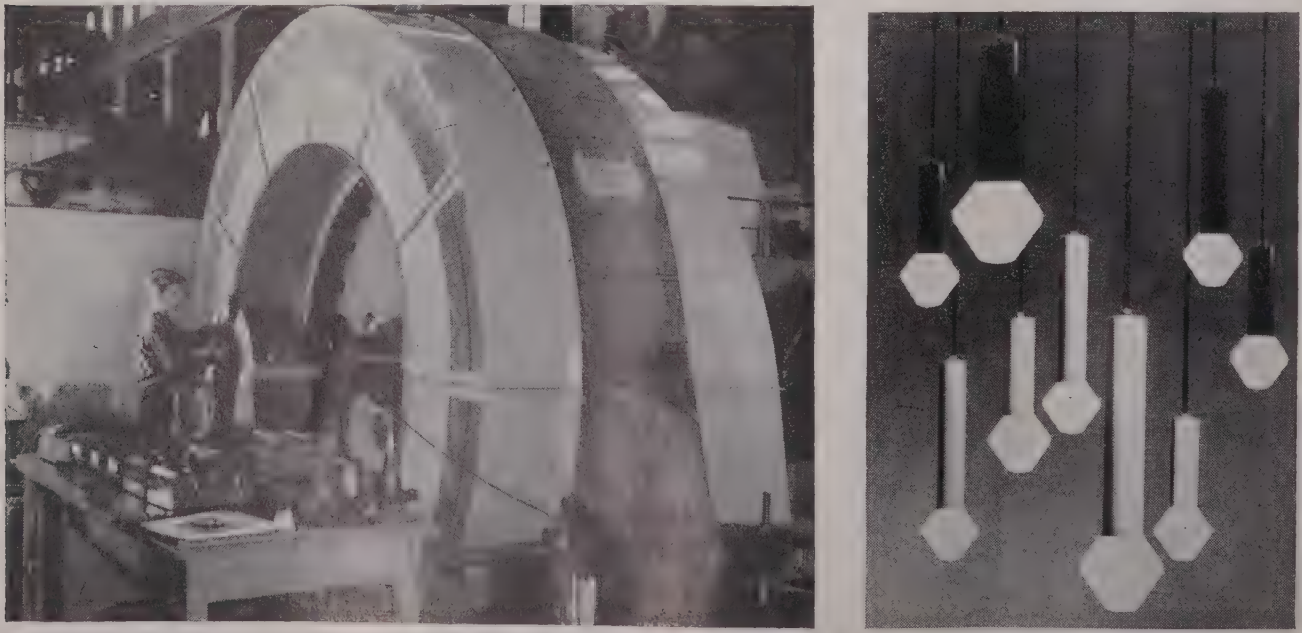
Table 4.—Electrical Imports, 1959

Class of Goods	(Million Marks)
Electric generators, motors and convertors, transformers and switchgear	3,723
Batteries	105
Accumulators	368
Bulbs, arc lamps and tubes for electric lighting, complete	407
Radio apparatus for telegraphy, telephony, television and radar (including parts and components)	2,986
Electronic tubes included in the group above	728
Apparatus (other than radio) for telegraphy and telephony	1,600
Electric heating apparatus (including domestic appliances)	223
Appliances for motor vehicles, aircraft, ships, cycles and i/c engines	600
Apparatus for measuring and controlling electric energy; electric signalling and safety apparatus; electric bells	242
Electro-medical and radiological apparatus	204
Portable electrical tools and appliances (including domestic appliances)	1,156
Insulated cables and wire	135

standard-type motors and transformers to certain special products, such as generators for the hydro-electric power plants in the north of the country. The biggest of these has a capacity of 42,000 kVA. The production of large power transformers is well established and the largest units, rated at 130,000 kVA, 120/10·5 kV and 100,000 kVA, 242/121/10·2 kV, were delivered recently. Transformers have also been exported. Special products which have been developed for the woodworking industry include grinder motors for pulp mills up to 8,000 h.p., and various types of drives for paper machines of which the biggest has a 1,800 kW main motor. Diesel-electric drives for ice breakers and railways are also manufactured. Exports of electrical machinery in 1960 amounted to 1,300 million marks.

In the radio industry the main emphasis has been on the manufacture of radio receiving sets, with a gradual introduction of television receivers. The combined annual production of domestic receivers is over 100,000, and there are 1,260,000 radio licences (population 4·5 million) and about 129,000 television licences. The country is practically covered by the v.h.f. network, but television transmissions cannot yet be received outside the south-western and southern parts of the country. The radio industry is able to satisfy most of the domestic demand, but certain components, for instance, electronic tubes, must be imported. Nevertheless, it has proved possible gradually to lower the share of foreign material to between 10 and 15 per cent of the total value of radio and television receivers. An appreciable demand is expected in this field as the television network grows. The same happened in the 1950's when the introduction of v.h.f. broadcasting caused a large-scale demand for receiving sets.

The incandescent lamp industry has long been able to supply the home market's requirements in full and extensive research has enabled a start to be made with exports. If fluorescent lamps and mercury vapour lamps are included, Finnish manufacturers produce nearly 1,000 types of bulb. The battery industry, which also



Left: A 800 h.p., 6,000 V grinder motor for a Finnish pulp mill on the factory test bed (Oy Stromberg). Right: An example of Finnish decorative lighting fittings (Oy Airam) has sufficient production capacity for domestic needs, counts flat cell batteries among its special products.

There has been a growing demand for domestic electrical appliances in the Finnish market over the past ten years. Electric cookers, heating apparatus, washing machines and refrigerators are made on a large scale and in the case of refrigerators manufacturers have shown themselves capable of competing overseas.

The distribution of imports of electrical equipment by the most important groups appears in Table 4. A comparison naturally shows that where domestic production is most developed imports are small, but component parts are still imported on a considerable scale.

It is neither practicable nor necessary for a small country like Finland to work independently in such a technical field as the electrical industry. There is therefore active participation in international organisations, such as those dealing with standardisation, and the country's foreign trade in electrical goods also calls for close contact with other countries. Contact is maintained with the I.E.C. and C.E.E. and the developments relating to the electrical industry within the E.F.T.A. and the Common Market are followed. Though international standards are applied on major projects, in co-operation with the other Scandinavian countries, there is, of course, much independent research and developmental work in electrical engineering in Finland and certain questions have been handled with reference to purely national considerations.

ENGINEERING IN EUROPE

Increasing Transformer Capacity

As is well known, the service life of a transformer is a function of the temperature of the hot spot of the winding. With natural oil circulation, this hot spot is usually situated in the top coil. The ageing of the winding insulation can be considerably retarded if the copper sections in the coils are so distributed that approximately the same temperature obtains all over the winding. It also improves the overload capacity of the transformer if the copper saved in the bottom coils of the winding is added to the copper in the hotter coils on top, so that the total copper weight remains unchanged. It is shown how thermal stressing of the winding can be obtained in transformers with vertical limbs and natural or forced oil circulation. The basic theoretical investigations by the author on these and allied problems were published earlier (*ETZ-A*, Vol. 82, No. 3, 1961: *Elektrotechn. und Maschinenbau*, Vol. 77, pp. 277-287, 1960). However, this, more descriptive, paper deals only with this one particular problem.—" Increase of the Service Life and Overload Capacity of Large Oil-Filled Transformers," by T. Boduroglu, *Elektrotechn. Zeitschrift B*, Vol. 13, No. 16, pp. 430-431, 7th August, 1961, in German.

Surge Divertors

A comprehensive consideration of the problem of improving and simultaneously saving on, the operation of surge divertors, starts with a survey of the types manufactured in Czechoslovakia and abroad, and then outlines the protection ranges of valve-type divertors juxtaposed with the magnitude of atmospheric and switching surges actually observed. There follow considerations of the possible ranges of reduction of the protective levels of the insulation and the design of the required divertors.

The decisive factor in divertor design remains the breaking capacity of the circuit-breakers on disconnecting long lines. In the author's opinion, it is advantageous to design the circuit-breakers to effect clearances without causing breakdown of the divertors. However, it is already possible to construct divertors to withstand even these stresses. The considerations refer to the voltage range of 200-400 kV. However, to provide single surge divertors with a protective range to deal with both atmospheric and switching surges presents certain difficulties, although the author suggests a solution of this problem. New types of divertors for the higher stresses expected with the raising of the line voltages have been designed and will be available in 1962.

Results of divertor tests obtained by the Czech research organisations are given. It is suggested that divertors from 200 kV be equipped with response counters and in specially exposed positions with discharge-current indicators recording the whole discharge process.—" Reduction of the Protective Level and Surge Divertors for Switching Surges," by V. Lesny, *Elektrotechn. Obzor*, Vol. 50, No. 6, pp. 319-324, June, 1961, in Czech.

Power System Interconnection

The principles and characteristics of systems with automatic control of frequency and power transmitted are usually interpreted from the viewpoint of steady phenomena. The present communication, however, deals with the transient phenomena in such systems, the analysis of which furnishes a more precise and complete representation of their characteristics. This analysis involves the solution of a fourth order differential equation for the tie-line power flow and one of the seventh order for the frequency. These permit determination of the individual components of the transient process, the effects of damping on them, and the relationship between damping and frequency and the given parameters. The relationships between the dynamic response of the primary and secondary regulators are also detailed and the significance of the setting of the secondary regulator is explained more generally. Usually these problems are solved on network analysers, but the use of a computer to evolve the relationships indicated above might taken even more time than the straightforward development of the theory provided here. Some numerical details are illustrated.—" Two Equal Interconnected Power Systems Operating in Parallel with Automatic Control of Frequency and Tie-Line Power Flow," by J. Merioka, *Elektrotechn. Obzor*, Vol. 50, No. 6, pp. 309-317, June, 1961, in Czech.

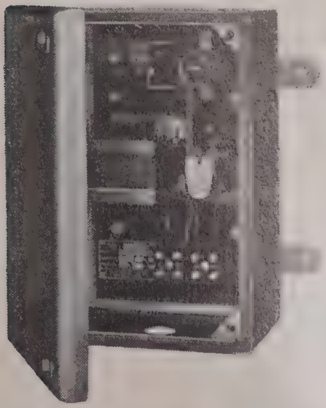
Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

NEW ELECTRICAL EQUIPMENT

SATURATED CHOKE LOAD DETECTORS

The saturated choke load detectors available from **LONDEX, LTD.**, Anerley Works, 207, Anerley Road, London, S.E.20, are for use in a.c. circuits which are subject to very large current fluctuations; i.e. they will detect loads of fractions of an ampère and withstand the continuous passage of current of the order of 25 to 50 A. A typical application is in connection with diesel generator sets where the unit is connected in series with the output of the generator and will shut down the set when all loads are switched off. The detector consists of a saturable choke working in conjunction with a relay which is operated by the voltage drop across the choke. In addition, each unit contains a rectifier and condenser and the whole is mounted on an insulated base and fitted in an industrial sheet steel dustproof casing with hinged lid and suitable for conduit entry. The load is connected in series with a choke. A relatively small a.c. current will provide a voltage sufficiently large to operate the relay and will not increase materially when the load current rises. The voltage drop across the detector at the maximum current values is approximately 7 V.

Standard units are for use on single-phase supplies, but three-phase models can be manufactured. Four versions are available. Of the 25 A types, the KR/CH requires a minimum of 0·3 A and the SSR/CH a minimum of 0·2 A. The choke is rated continuously at 25 A or intermittently at 30 A. Similarly, there are two 50 A types, the KR/CH requiring a minimum current of 0·5 A and the SSR/CH requiring a minimum current of 0·3 A. This choke is rated continuously at 50 A or intermittently at 60 A. Contacts on the relay can be normally open, normally closed or change-over, and a typical rating is 3 A at 250 V a.c.



Londex saturated choke load detector

TUBE REDUCING MACHINE

A machine for reducing electric heating elements has recently been developed by **W. H. A. ROBERTSON & CO., LTD.**, Lynton Works, Bedford. Production rates up to 60 ft/min are possible, and the elongation of each element is constant within 1 per cent. Eight pairs of alloy steel roll spindles are provided, alternate pairs being mounted at right-angles. The nominal roll diameter is 4in and the roll spindles are 2in diameter at the roll. The roll centres are adjustable between 3⅝in and 4¼in. Springs are fitted between the bearing chocks to maintain the roll gap. The adjusting screws have graduated circular scales to facilitate setting-up. A set of hardened steel guides is supplied for fitting between the rolls to prevent the tube fouling the rolls if bending occurs between roll passes.

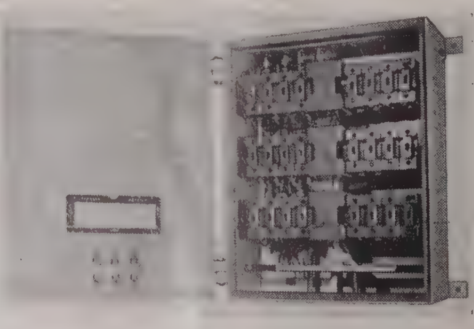
Robertson tube reducing machine

Each pair of rolls is driven separately by a 0·9 h.p. 1,350 r.p.m. screen protected squirrel cage motor of Laurence, Scott & Electromotors, Ltd., manufacture. The motors are flange mounted and are each coupled to a reduction gear unit comprising a single worm and worm wheel reduction to one low speed output shaft with spur gears connecting to two output shafts. The Allen West control panel has a 40 A main contactor operated by "start/stop" pushbuttons, controlling the eight motors simultaneously. Triple-pole adjustable magnetic overload protection is provided for each motor, the trip circuits being arranged so that an overload on any motor stops the machine. The electrical equipment is normally provided for a 400/440 V 3-phase 50 c/s supply, but equipment for other voltages can be incorporated.

HEAVY-DUTY DISTRIBUTION BOARDS

Two types of heavy-duty distribution boards are being produced by **PARMITER, HOPE & SUGDEN, LTD.**, Longsight, Manchester, 12. The "Fluvent-Saphyre" board is intended for industrial applications involving continuous processes. Incoming cable terminals are completely shrouded so that trained staff may wire up spare ways in complete safety while the board is in use and with the busbars "live." The shroudings of the outgoing cable terminals are removable and the cables can be connected from the front of the board without removing the fuse banks. Fuse bases and fuse carriers are of porcelain, designed to eliminate the possibility of accidental contact with the fuse-link during insertion or withdrawal. Safety precautions are taken further by the shrouding of "live" base contacts.

The "Fluvent Bricon" distribution board, in the same range, meets the requirements of the Factory Act in the shrouding of "live" conductors although it cannot be wired up with extra ways when "live." This board, which accommodates a greater number



"Fluvent-Saphyre" distribution board made by Parmiter, Hope & Sugden, Ltd.

B. & R. Relays type Q51/3 contactor/relay

of outgoing ways than a "Saphyre" board of the same dimensions and current ratings, may be more economical to install where the need for spare ways is not anticipated.

The new boards share a number of design features including the arrangement of fuse carriers. All are fitted throughout with Aeroflex Brilag energy limiting high-breaking capacity cartridge fuse-links to B.S. 88 : 1952, Category 440 AC5 (the equivalent of 35 MVA breaking capacity on three-phase circuits) and to the dimensions of Appendix J of B.S. 88. These fuse-links are of the end-blade type; they can be re-wired and are interchangeable with other makes.

ELECTROMAGNETIC CLUTCHES AND BRAKES

A range of electromagnetic clutches and brakes has been recently announced by the CLARK CLUTCH CO., LTD., 95, Phipps Bridge Road, Merton, London, S.W.19. All sizes are of a stationary field type and thus do not have slip rings or brush-gear. The present range extends from the Model 1.75 with a torque capacity of 10 lb-in to the Model 8.00 which can transmit 90 lb-ft. Similar values apply equally to clutch or brake types. Between these there are available at the moment models with torque capacities of 50 lb-in, 200 lb-in and 45 lb-ft. Direct current is required for operation, the standard voltage being 24 V. Units wound for other voltages up to 90 V are available if required. Various types of power unit are offered which cover the entire variety of normal operating requirements, including direct switching and pushbutton clutch and/or brake combinations. Torque limiting or smooth clutch pick-up or braking is carried out by the use of a power unit which incorporates a rheostat for voltage variation.

INDUSTRIAL CONTACTOR/RELAY

B. & R. RELAYS, LTD., Temple Fields, Harlow, Essex, have introduced the first true contactor/relay in their range. Known as the Q51, it is for a.c. operation both as a heavy duty switch and as a normal relay. It complies with B.S. 775 : 1956, Clause 5-6, Class IV.

It is suitable for a 440 V 50 c/s 3-phase supply and has an inductive 10 A rating. There are two versions, the Q51/2 with two banks and the Q51/3 with three banks. The coil can easily be changed for other voltages and the relay may be tropicalised. Operating speeds on the two-bank unit are 10-30 msec for pull-in and 10-25 msec for drop out. Pull-in for the three-bank type is also 10-30 msec, drop out 15-25 msec. AMP "Faston" connectors can be supplied, though the terminals, which are of the rising captive clamp type, are designed to hold two 7/·029 cables.

The Q51 contactor/relay is designed to withstand a flash test of 2,000 V. A wide variety of normally open, normally closed or change over contacts are possible. The two-bank model weighs 11 oz—the three-bank 13 oz.

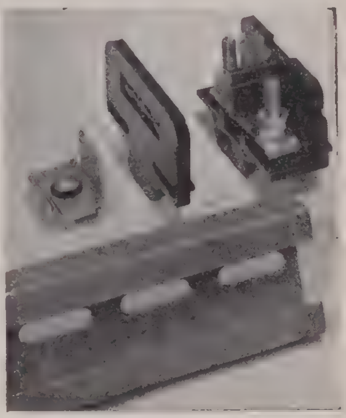
WIRE WELDER

The type D ST O wire welder made by Arno L. Fuchs and available in this country from R. H. COLE (OVERSEAS), LTD., 2, Caxton Street, Westminster, London, S.W.1, is intended for welding copper wires to each other or to wire strands, or for resistance wires of various alloys. It is suitable for cross sections from 0·01 to 12 sq mm (40-8 s.w.g.). The unit operates from a 220 V, 50 c/s supply and the welding current is 5-60 A, adjustable in 15 steps. Coarse adjustment is obtained by placing plugs in sockets "high," "medium," or "low," and fine adjustment is provided by a 5-position rotary switch with "off" position. The ends to be joined are twisted lightly together, cleaned for approximately 2 cm (¾in) to make contact with a plier electrode and cut off evenly. They are held upward and touched with an oscillating electrode until a satisfactory weld bead is produced. For wires above 1 mm dia. (19 s.w.g.) a fixed electrode should be used.

NYLON TERMINAL BLOCK

A terminal block now being manufactured by CRITCHLEY BROTHERS, LTD., Brimscombe, Stroud, Glos., is moulded in nylon and is fitted with 2 BA phosphor bronze studs. It is slightly smaller than their earlier block with 0 BA studs but it is interchangeable with the latter on the same channel mounting. The block is rated at 20 A and has been tested to 4,000 V to earth and between adjacent terminals. Both sizes are approved by the C.E.G.B. It is intended to offer the 0 BA terminal block in moulded nylon shortly. The blocks are available either as single units or made up into any number of ways.

British Rototherm model 1039 temperature controller



Critchley Bros. moulded terminal block

DUAL ZONE TEMPERATURE CONTROLLER

The model No. 1039, a mercury-in-steel, on-off temperature controller, which has independent circuits allowing control at any two points through one instrument, is now being produced by the BRITISH ROTOTHERM CO., LTD., Merton Abbey, London, S.W.19. Each of the two controller circuits consists of alloy steel Bourdon tubes, capillaries and temperature-sensitive bulbs, operating mercury switches rated up to 30 A at 230/250 V a.c. The differential is not adjustable but varies according to switching capacity. Indicator lamps and bottom entry electrical conduit are standard. The apparatus is made for temperatures between −20 and +1,000°F, with a minimum coverage of 100°F. The case is of aluminium alloy and the standard capillaries are 10ft copper sheathed with mild steel bulbs screwed ½in B.S.P.

ELAPSED TIME METER

A time recording meter produced by the English Electric Co., Ltd., English Electric House, Strand, London, W.C.2, can be applied to any equipment used intermittently and on which planned maintenance or a time log is required. It is normally connected so that it is automatically switched on and off with the apparatus being metered. It can register up to 9,999·9 hr in six-minute steps. The cyclometer register is driven by a self-starting, non-reversing, synchronous motor, through a train of gears. Operation is from an a.c. supply in the voltage ranges 100-125, 200-250 and 400-440 V. The frequency can be 50 or 60 c/s.

The meter is available in two case types. The type H21M is a 4in square, flush mounting, switchboard pattern case. The motor is mounted internally and two terminals are provided on the base-plate to connect the motor to the supply. The meter has a small revolving pointer to indicate that the motor is energised. The second is a 2½ or 3½in, type S25 or S35, square moulded black plastic case designed primarily for panel mounting. The motor is mounted externally and connection to the supply is made via a pair of flexible leads. It is lubricated with a special grease for operation in extreme temperatures.

D.C. POWER UNITS

In our issue of 4th August (page 189) the stabilised d.c. power supply units which are now available from Claude Lyons, Ltd., Valley Works, Hoddesdon, Herts., were erroneously stated to have a stability of ±5 per cent. The stability is in fact ±0·5 per cent after correction, against input voltage variations of ±10 per cent from zero to full load.

WELDING ELECTRODE

An improved "Diadem Emerald" electrode for use either as a "contact" or free arc electrode has been produced by Cooper & Turner, Ltd., Vulcan Road, Sheffield, 9, for general purpose welding on all thicknesses of mild steel from 14 s.w.g. upwards. The lighter gauges of this electrode may be used in all positions. A range of seven sizes from 12 gauge to $\frac{5}{16}$in diameter is produced. The deposition time per foot of electrode at maximum current ranges from 55 sec at 12 gauge to 72 sec at 6 gauge. Current values are 80 A average and 100 A maximum at 12 gauge and 195 A average and 235 A maximum at 6 gauge. The weight of electrode required to deposit 100ft of fillet weld by contact welding ranges from 7 lb when the leg length is ⅛in through 22 lb at ¼in to 74 lb at ½in.

COMPLEX RATIO BRIDGES

Two Gertsch complex ratio bridges now available from the Wayne Kerr Laboratories, Ltd., 44, Coombe Road, New Malden, Surrey, the CRB-1B and CRB-2B, are for precise measurements of in-phase and quadrature voltage ratios of three- and four-terminal networks such as transformers, synchros, resolvers, gyros and transducers. The instruments also measure the phase shift angle between 0 and 1° or 0 and 10°, and the tangent of the phase shift angle. Having an accuracy of 0·001 per cent, six-place resolution and needing no external calibration sources, the new bridges operate over the frequency ranges 30-1,000 c/s (CRB-1B) and 50-3,000 c/s (CRB-2B). Readout of the transformation ratios is directly from digital switches and is in terms of rectangular co-ordinates, tangent, or phase angle between the voltages involved, i.e. the phase shift present between the primary and secondary voltages of the device under test.

The basic circuit for the measurement of a.c. voltage ratios is the same in both instruments: a Gertsch ratio transformer functions as the ratio arms of an a.c. bridge and the off-null voltage obtained during the balancing operation is fed to a high gain (×500) amplifier. The amplifier provides a detector circuit which enables very small values of off-null voltages to be quickly detected, the sensitivity of the null detector being 10 μV. Other features of the circuit eliminate the effects of harmonic voltages, noise and quadrature voltages caused by phase shifts across the device being tested. Phase-reversal switches for both in-phase and quadrature voltages allow measurements to be made, without loss of accuracy, in any quadrant.

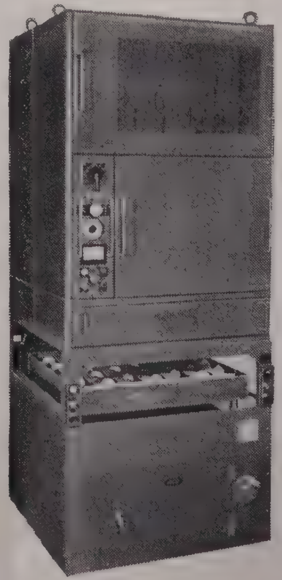
Both instruments have a power input rating of 100 W at 115-230 V, 50-60 c/s and both are provided with current and voltage terminals to eliminate errors caused by IR drops in connecting leads when the unit to be tested draws heavy current. The size of the equipment when supplied in cabinet form is 19½in wide by 16½in high by 13in deep; for rack mounting, the corresponding dimensions are 19, 14 and 12in.

Gertsch complex ratio bridge (Wayne Kerr)

ELECTRONIC PRE-HEATER

The cure time of all resin bonded and rubber products can be cut by electronic pre-heating before moulding. Heavy duty equipment designed for pre-heating large mouldings has been developed by Radyne, Ltd., Eastheath Avenue, Wokingham, Berks.

This model OCP/160 provides a continuous power output of 16 kW at 60/80 Mc/s. The power output can be maintained at any pre-set level between 2 and 16 kW, automatic tuning being provided by a motor driven variable tuning capacitor. The load to be pre-heated or dried is slid into the oven on ceramic rollers and is automatically raised, depending on the height of the load, to a constant dimension from the fixed upper electrode. The height adjustment can be manually fixed. Full protective equipment is incorporated including a.c. and d.c. overload protection, thermal protection of the oscillator valve and failure of air flow. A three-phase 50 c/s 360/440 V supply is required. Equipment to operate at other frequencies and voltages can be supplied.

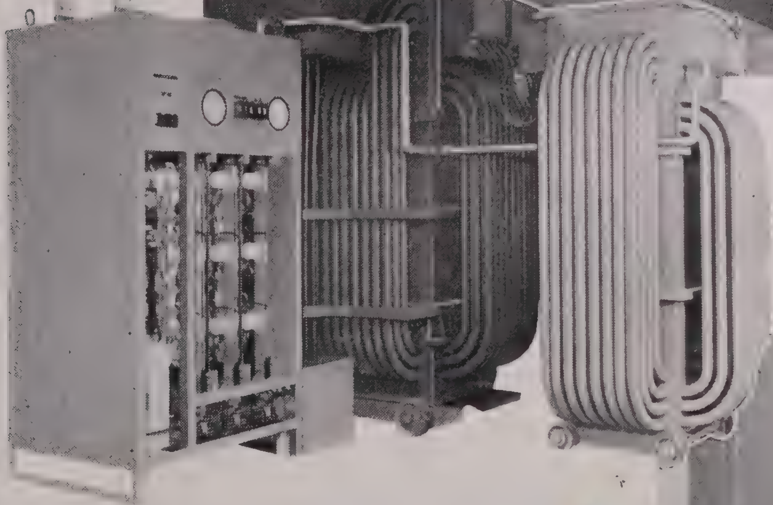


Radyne electronic pre-heating unit

RECTIFICATION

MERCURY ARC

A Mercury Arc Rectifier installation at the works of Western Chemicals Ltd., Alberta, providing an output of 12,000 amps at 510 volts D.C. for electro-chemical duty.

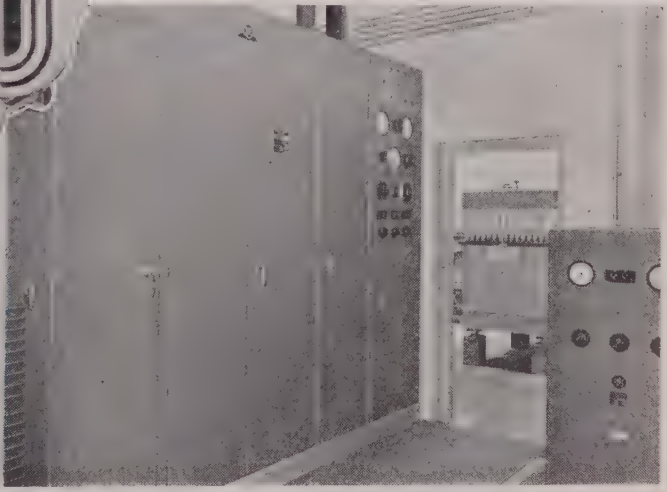


SILICON

A 750 kW 3,000 amp forced air-cooled Silicon rectifier for electrolytic duty in Persia. A voltage regulator is included for voltage variation over the range 180/250 volts D.C.

GERMANIUM

A 6,000 amp water-cooled Germanium rectifier providing a continuous output at 100 volts D.C. for an electrochemical process at the Luton Works of Laporte Industries Ltd.



MERCURY ARC OR SEMI-CONDUCTOR

HEWITTIC RECTIFIERS

HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd.

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save space·cost·time 5 to 800 Amps · · · · ·

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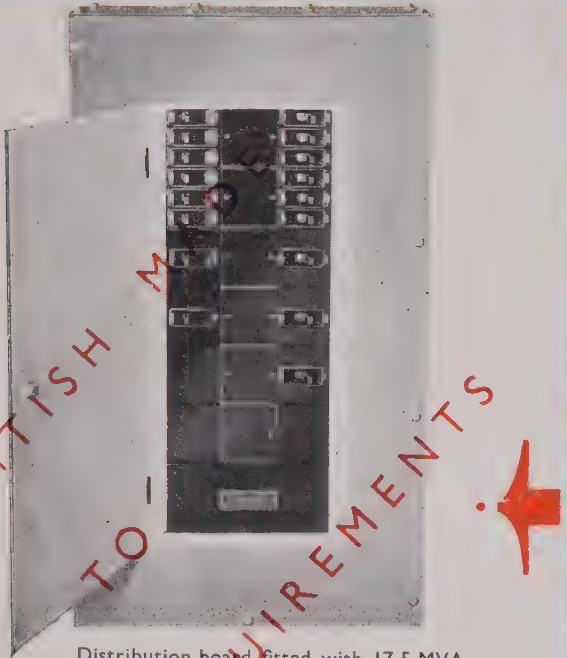
BRITISH MADE TO BRITISH REQUIREMENTS

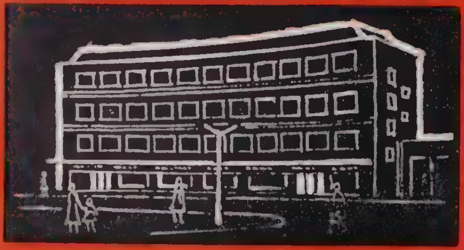


Distribution board fitted with 17-5 MVA 100 amp circuit-breakers. This compact board is only 41″ high × 24″ wide × 9″ deep

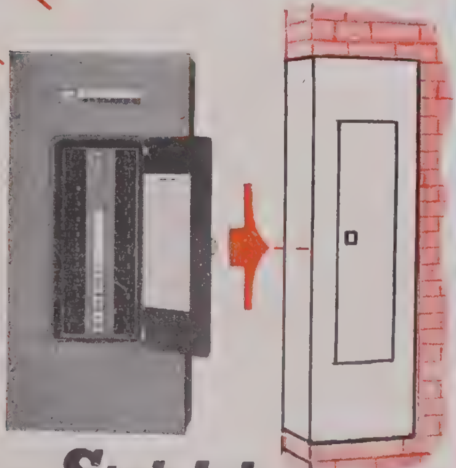
SCHOOLS

OFFICES

no separate floor space needed


STORES

DWELLINGS



36 way *Stab-lok*

distribution board incorporating 36 circuit-breakers in ratings from 5 to 60 amps.

INDUSTRY

ECC **MOULDED BREAKERS LIMITED**

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Ask your usual wholesaler for details or contact us direct

HOSPITALS

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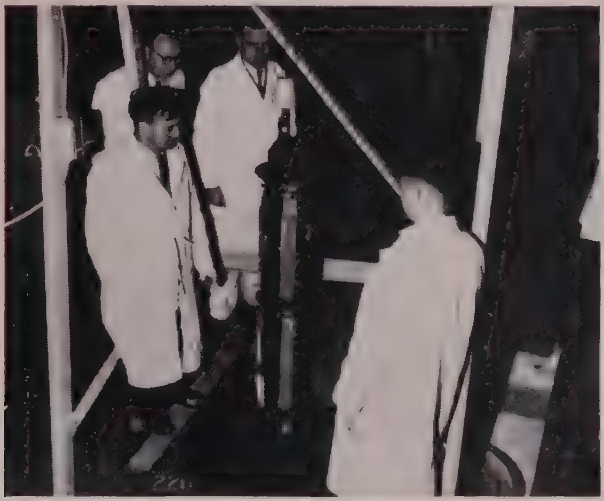


A carrier with nine fuel elements being loaded through a fuel standpipe into No. I reactor at Berkeley

Lowering a fuel element through a standpipe on the pile cap at Bradwell

THE first two civil nuclear power stations in Britain, at Berkeley and Bradwell, are nearing completion. The No. 1 reactors in both stations are now being loaded with natural uranium fuel. At Berkeley, loading commenced on 12th August and at Bradwell two days later. It is expected that criticality will occur about two weeks after loading began. Full power operation from the No. 1 reactors in each station is expected at the end of this year.

Berkeley power station is situated on the bank of the Severn estuary between Gloucester and Bristol and when completed will contain two reactors giving a total net electrical output of 275 MW. The total output from Bradwell, when completed, will be 300 MW. Bradwell is on the Blackwater estuary in Essex. Both stations are being built by the Nuclear Power Group and site work at both stations commenced in January, 1957.

PERSONAL RADIATION DOSEMETERS

A NEW British Standard, B.S. 3385:1961, lays down requirements for direct reading personal dosemeters for X- and gamma radiation. A note in the foreword draws attention to the effect of beta radiation on measurements of gamma radiation dose and recommends that when the dosemeter is used in the presence of beta radiation, an appropriate sleeve should be fitted to the instrument. It also points out that unsealed instruments may be seriously affected by large changes in humidity, changes in atmospheric pressure and by the presence of significant concentrations of radioactive or ionised gases. In such circumstances, a sealed instrument should be used. A companion standard, for film badges, is being prepared.

This is the first British Standard to be prepared under the authority of the newly-formed Nuclear Energy Industry Standards Committee of the British Standards Institution. Under the direction of this committee, several technical committees are at work, dealing with nuclear terminology, units and symbols, protection against ionising radiation, nuclear reactor safety and radioisotopes. Almost all their work is being done in close consultation with the International Organisation for Standardisation (I.S.O.) since it is important that nations should be uniform in their standards in the field of nuclear energy.

Copies of B.S. 3385 may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 3s each.

VIEWS on the NEWS

By "REFLECTOR"

THE demise of the Fixed Price Lighting Co. to which I recently referred will not be without its repercussions. Its customers, freed from the restrictions which the system imposed, will want better installations but are apparently unwilling to pay for them. Accordingly, says the *South London Press,* Mr. Mellish, the M.P. for Bermondsey, is pressing the London Electricity Board to give an undertaking that none of the company's customers will suffer financially through having to meet the cost of his own re-wiring. The Board has already offered to do the work at the customer's expense, on deferred terms if necessary. Why consumers should not pay is not evident to me—except, of course, that nowadays it is customary to expect somebody else to provide.

* * *

A contributor to the *New Daily* has resurrected the scare about the effects of modern artificial lighting upon eyesight. After stating, among other statistics, that there are about 35 million pairs of spectacles in use in this country (some people must have several pairs) he asks:—

> "If a child, before its eyes are damaged, can see comfortably with the aid of one candle a foot away, why on earth should we need the equivalent of from 20 to 30 candles a foot from where we are working?"

He mentions "dedicated pioneers in the work of providing eye-saving lighting installations" and offers to put readers in touch with a firm doing this kind of work.

* * *

Although preferable to the traditional hairpin, the fuse replacement method suggested in a letter to Nettle Accessories, Ltd. (by a Scottish consumer) is still not to be encouraged. He says:—

> "I live in a large housing estate and most of the houses are fitted with Nettle fused plugs, well sometimes I had to buy new fuses and they ranged in price from 6d to 8d each well I had an idea and I put it into operation and do you know that with a piece of ordinary silver paper you can make a *done* fuse last for ever, all you do is wrap the fuse in a small piece of silver paper and it is like new again. Well I thought of sending it into one of the Sunday papers as a home-hint but then I thought it might affect your sales so I am letting you know first before I do so, you can let me know if it would be alright."

* * *

Electronic computers are capable of performing remarkable calculations: in fact there would seem to be no limit to their capabilities if we are to believe a story in *The Times,* emanating from the United States. As readers acquainted with the classics will know, there has been some doubt about the authorship of the *Iliad* and *Odyssey,* although Homer (if he ever existed) has commonly been regarded as responsible. Samuel Butler, for example, contended, from internal evidence, that the author was a woman. The American report relates only to the *Iliad.* A graduate student of Columbia University is said to have fed a card for each of the 15,693 lines of the epic into a computer. He claims that "the computer by analysing the metre can detect differences in metric pattern and reveal stylistic mannerisms that could not normally be discovered." But, even so, why does he think that Homer wrote the *Iliad*? All he seems to have proved is that the whole of it was by one author.

* * *

Small country communities frequently reject lighting proposals, generally on account of the cost. But there are sometimes other reasons: at Brasted Chart, Kent, some householders fear depreciation of their property and they say that they do not want "urban trappings," according to the *Evening Standard.*

On the other hand the village of Thornton-le-Dale, Yorkshire, is glad of an opportunity of improving its lighting. Here since 1780 the village has had a parish bull for local herd masters. Now the Parish Council has decided that the bull is no longer necessary and that the cost of his upkeep shall be devoted to extra street lighting. I see from the *Yorkshire Post* that the allowance has been three guineas a year, hardly adequate for the sustenance of a bull I should have thought, and certainly unlikely to make much difference to the lighting.

* * *

Scotland was becoming aware of the possibilities of electric lighting 70 years ago. The *Electrical Review* of 15th August, 1881, published three consecutive notes on the subject, as follows:—

> "The Dundee Gas Commissioners have appointed a Committee to consider and report on the electric light. It was stated at their recent meeting that several large consumers in the town were fitting up their premises for the electric light, and that if it were found satisfactory its development would affect the gas revenue. . . . The Portobello Town Council has decided that, in view of the progress being made in the use of electric light, it would be unwise at present to adopt the Burgh Gas Supply (Scotland) Act, 1876. . . . So successful has been the trial of the electric light in Greenock that its permanent adoption for lighting the quays, docks and harbours may be taken as settled."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. S. S. Eriks, managing director of Mullard, Ltd., has been created an honorary K.B.E. in recognition of his valuable services to British official interests. During the war Mr. Eriks integrated the interests of Philips (Eindhoven, Holland) in this country into the war effort and after the war he became managing director of Mullard, Ltd., and chairman of Philips Electrical Industries, Ltd.

The Minister of Power has re-appointed **Sir William Holford,** F.R.I.B.A., M.T.P.I., as a part-time member of the Central Electricity Generating Board.

Mr. E. J. Aaronson, F.C.A., has been appointed general manager, overseas operations, of the General Electric Co., Ltd., as from 1st July. He was previously economic and financial adviser (export).

Mr. A. G. Sweetland has been appointed technical development manager by Cable Covers, Ltd., and will be responsible for co-ordinating advances in the field of electrical accessories and generally promoting the interests of the Power Engineers' Equipment Division. Before joining Cable Covers, Mr. Sweetland was with British Insulated Callender's Cables, Ltd. Following a period as assistant to the deputy chief engineer he was appointed to the Accessories Division as assistant chief engineer in 1953 to form a development department.

Aberdare Holdings, Ltd., announce the appointment of **Mr. Norman Care,** M.I.E.E., M.B.I.M., as general sales manager. Mr. Care will control the whole of the sales activities, at home and abroad, of the manufacturing companies in Great Britain which form part of the group.

A group sales office has been established at the Blackwood factory of South Wales Switchgear, Ltd., to co-ordinate the outside sales of Aberdare Cables, Ltd., South Wales Switchgear, Ltd., Aberdare Engineering, Ltd., and the Neckar Water Softener Co., Ltd.

Mr. N. Care

Mr. G. J. Reeves

Mr. G. J. Reeves, A.M.I.E.E., has been appointed industrial sales manager of Aberdare Holdings, Ltd., and will co-ordinate all home sales in the industrial field for the group.

Mr. K. V. A. Lilley, A.M.I.E.E., A.M.B.I.M., has been appointed senior assistant engineer (distribution design) in the No. 3 (Sheffield) Sub-Area of the Yorkshire Electricity Board, to succeed **Mr. J. K. Dent,** M.I.E.E., A.M.B.I.M., who has joined the headquarters staff of the Central Electricity Generating Board in London.

Mr. Lilley was formerly with the Eastern Electricity Board. He joined the Sheffield Sub-Area in 1951.

Mr. John Judge has been appointed northern contracts manager of the Kenwood Group. He was previously northern manager of the electrical appliance division of Easiclene (1938), Ltd., and he commenced his selling career with Hoover, Ltd.

Mr. W. Szwander, Dipl.Ing., M.I.Mech.E., M.I.E.E., has been elected chairman for the 1961-62 session of the Northern Ireland Centre of the Institution of Electrical Engineers, in Belfast. Mr. Szwander gained his early experience in the supply industry, serving from 1932 with the Warsaw Municipal Electricity Undertaking where, at the outbreak of the war, he was head of the Electrical Division in the Construction Department. Following active service in the Polish Army he joined the Metropolitan-Vickers Electrical Co., Ltd. (now A.E.I.), at Trafford Park in 1941 and in 1947 was appointed chief technical assistant with the Belfast Corporation Electricity Department. His present position is that of construction engineer and chief technical assistant. Since 1934 Mr. Szwander has contributed several articles to the technical press, including the *Electrical Review*, covering a wide range of electric power supply subjects.

Mr. W. Szwander

Mr. Walter George Thompson, the Sheffield area superintendent of A.E.I. Lamp & Lighting Co., Ltd., for the past seven years, has retired after over 50 years with the company. He is succeeded by **Mr. Edward Madders,** who has been senior lighting engineer at Sheffield for the past five years.

Mr. W. G. Thompson

Mr. E. Madders

The British Broadcasting Corporation announces the appointment of **Mr. J. A. G. Mitchell** as Scottish engineer. He succeeds the late Mr. F. W. Endicott and becomes responsible for the engineering services of the B.B.C.'s sound and television studios and outside broadcast units in Scotland. Mr. Mitchell joined the B.B.C. in London in 1927 and has been regional engineer, Northern Ireland, since 1950. He takes up his new appointment on 4th September.

Mr. Mitchell will be succeeded as regional engineer, Northern Ireland, on 28th August by **Mr. J. D. MacEwan,** B.Sc., A.M.I.E.E., A.M.Brit.I.R.E., who joined the Operations and Maintenance (Sound) Department of the B.B.C. in Glasgow in 1947 and transferred to the Scottish Television Unit in 1953. He was appointed senior lecturer (technical operations) at the B.B.C. Engineering Training Department, Wood Norton, in 1956 and became engineer-in-charge, television, Birmingham, in 1960.

Following the recent death in Switzerland of Mr. Philip Canning, **Mr. Laurie Woodhead,** director and general manager of Cossor Instruments, Ltd., and past-president of the

Scientific Instrument Manufacturers' Association of Great Britain, has accepted the chairmanship of the organising committee of the International Instruments, Electronics and Automation Exhibition (to be held at Olympia, London, from 28th May to 2nd June, 1962).

Mr. J. P. Engels has been appointed managing director of Philips Electrical, Ltd., in succession to **Mr. G. F. Hofman,** who has reached retiring age after 40 years' service with Philips.

Mr. C. J. R. Blackett has been appointed district manager of the South Western Electricity Board's Exeter District with effect from 1st September. Mr. Blackett succeeds Mr. Frank Richardson, who has been appointed district manager at Bristol. Mr. Blackett, who now assumes control of the Board's second largest district, has been district commercial manager for Bristol South for just over seven years, before which he was Bristol district engineer.

Mr. C. J. R. Blackett

On being elected a director of Marryat & Scott Holdings, Ltd., on 4th August, 1961, **Mr. Reginald Walker** relinquished the office of secretary of the company. **Mr. A. J. Bryant,** F.C.A., has been appointed as secretary in his place.

Mr. M. Rose has joined Sunbeam Electric, Ltd., as area manager for the Midlands. He was previously with Ada (Halifax), Ltd. His home address is 11, South Drive, Edgbaston, Birmingham, 5 (telephone: Selly Oak 0272).

OBITUARY

Mr. W. F. Higgs.—The death occurred on 8th August of Mr. Walter Frank Higgs, M.I.E.E., co-founder with his brother of Higgs Motors, Ltd., and chairman of that company. Mr. Higgs was born at Kidderminster in 1886 and after attending the Birmingham Technical School gained experience with the General Electric Co., Ltd., the British Thomson-Houston Co., Ltd., and the Electric Construction Co., Ltd. Apart from his very successful business activities, Mr. Higgs gave much time to public service. He was president of the Birmingham Chamber of Commerce in 1948; a life governor of Birmingham University; and he served on the Birmingham City Council from 1934 to 1937. In the latter year he succeeded Sir Austen Chamberlain as Member of Parliament for West Birmingham and held that seat until 1945. During his period in the House of Commons he was a member of the Select Committee of National Expenditure.

Mr. R. Stuart Pilcher, C.B.E., M.Inst.T., whose death occurred last week, was prominent in municipal passenger transport for many years. His initial training, as an electrical engineer, was gained with the Montreal Street Railway Co. At the early age of twenty-four he became general manager of the Aberdeen Corporation tramways and later of the Edinburgh tramway system which he converted from cable operation to electric traction. He went to Manchester in 1929 as general manager of the city's Transport Department, a position he held for about seventeen years. During the last war he was appointed regional transport commissioner for the West Midland Traffic Area, a position which he held until his retirement in 1952.

Mr. Pilcher was a past-president of the Institute of Transport and of the Municipal Passenger Transport Association. He was 79.

Mr. C. W. Haycraft, area manager in the Midlands for the Electrical Division of Radiation, Ltd., died suddenly on 9th August while on holiday in Cornwall. Mr. Haycraft, who was 48, joined the Jackson Electric Stove Co., Ltd., after leaving the Merchant Navy at the end of the war and was technical representative in the London area up to 1956.

Mr. Walter R. J. Martin, personnel manager of the Telegraph Construction & Maintenance Co., Ltd., and of Submarine Cables, Ltd., died suddenly on 30th July at the age of 56.

A memorial service for **Mr. A. E. Iliffe,** the late chairman of the Benjamin Electric, Ltd., will be held at the Church of Saint Sepulchre, Holborn Viaduct, on Monday, 4th September, at 12 noon.

WILLS

Mr. W. R. C. Coode-Adams, M.Sc., Ph.D., F.R.I.C., M.I.E.E., Principal of Faraday House Engineering College, 1937-57, who died on 31st May last, left £16,764 gross (£16,607 net value).

Mr. F. Shakeshaft, O.B.E., A.M.I.E.E., M.Inst.F., formerly station development engineer to the Central Electricity Authority, who died on 17th May last, left £14,352 gross (£14,238 net value).

Mr. Walter Donovan, A.M.I.E.E., former chairman of the Donovan Electrical Co., Ltd., who died on 3rd May, left £50,085 gross (£48,394 net).

Radio Show Reports

Next week's issue of the *Electrical Review* will include a general survey of the National Radio and TV Exhibition at Earls Court (23rd August to 2nd September). Fuller reports will be published in special issues of *Wireless World* (price 2s 6d). The September issue (published on 22nd August) will contain a preview of the Show, including a stand-to-stand guide, floor plans and detailed descriptions of exhibits. In the October issue there will be an appraisal of technical advances at the Show. The same issue will also have a survey of aeronautical electronics at Farnborough and reports on the German, Dutch, and Danish Radio Shows.

AUTOMATION LECTURE

The first annual lecture of the British Conference on Automation and Computation (B.C.A.C.) will be given by Dr. D. G. Christopherson, O.B.E., F.R.S., Pro-Vice-Chancellor of the University of Durham. He will speak on the subject "Mathematics—Friend or Foe?" at the lecture theatre of the Institution of Electrical Engineers, Savoy Place, London, W.C.2, on Wednesday, 27th September, at 5.30 p.m. The lecture is open to all members of the 31 member societies of B.C.A.C.; others should apply for tickets (free) from the Honorary Secretary, B.C.A.C., c/o The Institution of Electrical Engineers, Savoy Place, London, W.C.2. Tea will be served at 5 p.m.

Combustion Engineering Conference

A one-day conference has been arranged by the Combustion Engineering Association to take place on Thursday, 19th October next, at the Northern Exhibition of Fuel and Power for Industry at the Queens Hall, Leeds, at 10.15 a.m. The opening address will be given by the chairman of the conference, Mr. N. A. McNeill, engineer-in-chief, Unilever, Ltd., president of the Association. The morning session will be devoted to grit and dust from small boiler plants. A paper on the measurement of air pollution and the equipment for prevention will be presented by Dr. R. Jackson (British Coal Utilisation Research Association) and another on the cost of installation and maintenance of equipment by Mr. H. Westwood (James Howden & Co., Ltd.). At the afternoon session a paper will be presented by Mr. G. Gill (National Industrial Fuel Efficiency Service) on the seventh N.I.F.E.S. progress survey.

INDUSTRIAL NEWS

Three Telephone Firms to Merge

THE Plessey Co., Ltd., Automatic Telephone & Electric Co., Ltd., and Ericsson Telephones, Ltd., are to combine to pool their research cost and production facilities. Announcing plans for a merger, the three companies say that this will avoid considerable overlapping of effort in the communications field and lead to a more intensive and efficient use of research and production facilities.

The merger will take the form of a bid by Plessey, which already holds a small proportion of the ordinary shares of the other two companies, for the balance of their entire issued capitals. The bid will be on a mixed cash, share and new convertible loan stock basis.

If the offers are fully accepted the effect of the merger will be to give existing Plessey shareholders 61·7 per cent of the bigger Plessey equity, to A.T.E. ordinary holders 21·1 per cent and to Ericsson ordinary holders 17·2 per cent.

A.T.E. and Ericsson will continue as separate concerns with their own boards of directors and will be represented on the main board of the new group.

Under the proposals, Plessey, prior to the merger, will capitalise £2,934,098 of its share premium account and make a one-for-three scrip issue to its existing ordinary shareholders. Plessey forecast dividends totalling 15 per cent for the current year on the enlarged capital. (See also page 274.)

Ionising Radiations

A safety code for workers exposed to ionising radiations in industry is laid down in the Ionising Radiations (Sealed Sources) Regulations, 1961 (S.I. No. 1470, H.M. Stationery Office, 9d net), made by the Minister of Labour. Most of the requirements will come into operation in six months' time, but those requiring the notification of the use and disuse of ionising radiations in factories became effective from 15th August.

The regulations impose requirements for safeguarding the health and safety of persons employed in factories and other places to which the Factories Acts apply, who may be exposed to ionising radiations from sealed radioactive substances, and from certain machines, such as X-ray apparatus. They require the restriction of the exposure of workers to such radiations, the adequate shielding of sources of ionising radiations, and instructions for workers likely to be exposed to them about the hazards involved and the precautions to be taken.

COLSTON DISHWASHER FOR AUSTRALIA

Under an agreement announced on Monday by Charles Colston, Ltd., and Pye Industries, Ltd., Sydney, the "Colston" automatic dishwasher is to be marketed in Australia.

Initially, Pye will distribute dishwashers imported from England but plans are already being made for local assembly from imported components, with the gradual introduction of Australian-made parts until the dishwasher is manufactured completely in Australia.

Sir Charles Colston said in London: "We expect great things of the Australian market. It is one of the most appliance-conscious countries in the world. A high standard of living has led to labour-saving devices being taken as a matter of course in the home. The Australian housewife is well ahead of her British counterpart in their use."

The present agreement follows the signing of a similar contract with one of West Germany's most important electrical appliance manufacturers, Rowenta. The German firm is now importing "Colston" dishwashers on a substantial scale and later will manufacture them under licence.

Production Engineers' Annual Dinner

The principal speaker at the annual dinner of the Institution of Production Engineers at the Dorchester Hotel, London, on 1st November, will be Viscount Chandos, P.C., D.S.O., M.C., chairman of Associated Electrical Industries, Ltd., and president of the Institute of Directors.

Tickets, price £3 5s each (excluding wines), may be obtained from the secretary of the Institution, 10, Chesterfield Street, Mayfair, London, W.1.

Parsons' New London Offices

NEW London offices for C. A. Parsons & Co., Ltd., were officially opened at 40, Broadway, S.W.1, last week. The floor area—3,690 sq ft—is practically double that of the company's previous London office (56, Victoria Street, London, S.W.1), which was opened 40 years ago.

The move is complementary to recent developments at the company's Newcastle works where a large nuclear research station and a new mechanical research laboratory have been installed. Parallel with these developments was the necessity for the expansion of the London offices, which cover a very wide range of activity including technical sales representation for turbo-generators, turbo blowers and compressors, feed heating and condensing plant, transformers, synchronous condensers and certain other products of the company including the manufacture of expansion joints, turbine blading, castings, automatic control equipment, steel fabrications and gas turbines.

Liaison with the C.E.G.B. consulting engineers and overseas clients also figures largely in these activities. Further, the London office provides a maintenance service in the area.

Mr. G. A. S. Bartley, London manager, seated at his desk in the new London offices of C. A. Parsons & Co., Ltd.

INDUSTRIAL NEWS *[continued*

ELECTRICAL MACHINERY PRODUCTION

FIVE companies, each employing over 7,500 people, accounted for more than half the total sales of electrical machinery in 1958. "The Report on the Census of Production for 1958, Part 56, Electrical Machinery" (price 2s) shows that these five firms also employed over half the operatives and other employees in this branch of the electrical industry and incurred nearly two-thirds of the capital expenditure. Their net output per employee was £1,101 compared with an average of £1,042.

Between 1954 and 1958 the number of enterprises producing electrical machinery fell from 231 to 227 but the number of establishments increased from 354 to 373. Goods produced and work done rose from £249,733,000 to £343,533,000, net output from £138,813,000 to £206,657,000 and employment from 177,781 to 198,263. Expenditure on new building work rose from £2,620,000 to £4,435,000 and on new plant and machinery from £5,359,000 to £10,253,000.

The most important items of production by value in 1958 were motor starting and control gear (£29,513,000), switchgear and switchboards (other than telegraph and telephone) not exceeding 600 V (£25,991,000), over 600 V and not exceeding 15 kV or 350 MVA (£19,095,000), over 15 kV and 350 MVA (£19,229,000). The production of motors, 1-50 h.p., sold separately, was valued at £15,647,000. The production of transformers over 30 MVA amounted to £9,735,000 and of alternators over 30 MVA to £8,506,000. Switchgear and control gear also showed the biggest increases over 1954.

Part 61 of the Census Report, "Miscellaneous Electrical Goods," has also been published (price 2s) and this covers electrical equipment for vehicles, accumulators, electric lamps and "other electrical goods."

Arc Welding

A new publication recently issued by Associated Electrical Industries, Ltd., "The A.E.I. Arc Welding Guide," replaces the previous Metrovick Electrode Guides. In addition to the latest data on the range of A.E.I. welding electrodes, this enlarged booklet contains technical information on welding and provides information for the welding fabricator. Included in the new sections are a complete list of British Standard Specifications relating to welding processes and applications, notes on the care of electrodes, and a brief list of A.E.I. arc-welding plant. Copies of this publication, No. 1891-71, may be obtained free on request from the A.E.I. Heating and Welding Department, Trafford Park, Manchester, 17, or any district office of the company.

All-electric Dwellings

THE South of Scotland Electricity Board has produced two illustrated brochures dealing with electricity in the home. The first, "All-electric Flats, Royston, Glasgow," marks the official opening by the Lord Provost of Glasgow on 10th August of a block of 20-storey flats which are all-electric in the fullest sense of the term, being equipped with electrical under-floor warming, electric cookers, electric water heaters, and other items of electrical equipment. No fireplaces have been provided and there is no gas supply to the buildings. Altogether the development includes 453 dwellings.

The new brochure takes the place of one issued by the South of Scotland Board in 1955, describing the first multi-storey electrically floor heated block of flats at Kirkcaldy, which, as a result of the widespread demand, ran to four editions. The Royston brochure, as well as describing in detail the new flats, includes general information about electrical floor heating and an analysis of the actual average weekly costs for other electrically floor heated blocks of flats which have been in use for several years.

The second brochure, "Make the Most of Your All-Electric Home," has been designed for the use of local authority tenants.

FLOODLIGHTING AT GREY'S COURT, HENLEY

This attractive Elizabethan building was floodlit during a recent "Son et Lumière" performance, set in the ruins of the original 13th century house, by a new form of floodlight, a 500 W quartz iodine filament lamp only 2½ inches long. The lamp, which operates without control gear of any kind, is one of a range being developed by Atlas Lighting, Ltd.

WHY THEY DO NOT EXPORT

Last March Marplan, Ltd., undertook an inquiry on behalf of the Export Action Now Committee of the Institute of Directors to discover their attitude towards export trade. In all, 52 concerns employing fewer than 300 people were interrogated and the results are set out in a report prepared by Marplan (2-3, Cursitor Street, London, E.C.4.).

It was found that about a quarter of these firms were exporting "vigorously"; the exports of half of them were declining or stationary at a low level; and just under a quarter were not interested in export. Less than 10 per cent of the non-exporting firms wanted to export but did not know how to set about it.

N.E.C.T.A. Retailers' Label

A tie-on label for the use of its members has been produced by the N.E.C.T.A., Ltd. (allied to the Electrical Contractors' Association). This bears the N.E.C.T.A. "In Safe Hands" symbol and the words "Approved Retailer." On the reverse the member's name and address can be printed and there is space for the price of the appliance to which the label is attached, and any other relevant information.

DOMESTIC APPLIANCE STATISTICS ANALYSED

THE output of the British domestic electrical appliance manufacturers in 1960 amounted to £166 million or 10 per cent of the total production of electrical and allied engineering goods. A detailed analysis of the production of some 23 different types of appliance (in some cases going back to 1948) has now been published by the British Electrical and Allied Manufacturers' Association. The "B.E.A.M.A. Statistical Review of Domestic Electrical Appliances" also contains information on imports of appliances, with details of country of origin, retail sales by Electricity Boards, hire-purchase and purchase tax changes, price indices, estimated saturation factors at home and abroad and production in selected overseas customers. The 70-page booklet is available only to subscribers to the B.E.A.M.A. Statistical Service who will also receive quarterly supplementary information giving comparisons of appliance deliveries and an analysis of imports.

In the introduction it is pointed out that more than three-quarters of the 1960 appliance output was accounted for by five major appliances: washing machines, refrigerators, cookers, vacuum cleaners and space heaters. The first two accounted for 50 per cent of the total by value. The bulk of the output comes from large manufacturing units, eleven firms accounting for three-quarters of the total. In 1960 exports amounted to a fifth (£33 million) of total production and a third went to European countries.

Area Boards' Appliance Sales

An improvement in June in the sales of cookers and washing machines is shown in the latest return by the Electricity Council of the number of new domestic electrical appliances sold by the Area Electricity Boards in England and Wales. Sales of clothes dryers were also higher than in June last year but the percentage increase was slightly smaller than in May. On a twelve-month basis, only cookers showed a rise on the previous period. There is no sign of a revival in refrigerator sales; in fact there was a decline compared with the previous month.

Type of Appliance	Month ended 30th June, 1961		Twelve months ended 30th June, 1961	
	Total	Change %	Total	Change %
Cookers ...	29,125	+13·8	346,328	+ 1·8
Water Heaters				
Immersion ...	26,637	−13·9	193,397	− 0·2
Storage ...	5,391	− 0·6	63,661	− 3·9
Wash Boilers	4,395	− 2·1	54,391	−12·3
Washing Machines ...	8,562	+25·9	100,174	−31·1
Refrigerators	21,653	−27·4	125,341	−25·4
Clothes Dryers	1,229	+30·1	55,360	n.a.

REFRIGERATOR DELIVERIES

Deliveries to the home market of British-made domestic refrigerators totalled 117,805 in June, 7 per cent less than a year earlier. The June deliveries were 2,730 less than the May figure but higher than in earlier months of the year.

Total deliveries to the home market for the first six months of this year were 534,547, a decrease of 18·2 per cent compared with the corresponding period of 1960.

Deliveries overseas were 12,626 in June, a decrease of 14·5 per cent on a year earlier. The total export deliveries for the first six months of the year were 75,741, a decrease of 1·4 per cent on the corresponding period of 1960.

New Scottish Substation

The Scottish branch of South Wales Switchgear, Ltd., is installing 33 kV EO1 type oil circuit-breakers, associated control and relay panels, and voltage transformers for the 132/33 kV grid substation at Westfield, Fife, which will supply the £6,500,000 Lurgi coal gasification plant opened by the Queen in June. This substation, situated near Cowdenbeath, is being established by the South of Scotland Electricity Board to meet the increasing load in Fife. The two leading consumers will be the Lurgi plant and the National Coal Board's adjacent open-cast coal site.

A.E.I. Factory for Sale

The Times reports that London estate agents are offering for sale the Tottenham factory of Associated Electrical Industries (formerly Siemens Edison Swan) which is being closed down upon the cessation of the manufacture there of transistors and semiconductor apparatus. The works has a floor area of about 160,000 sq ft.

EKCO EXPORT COMPANY

E. K. Cole, Ltd., have formed a subsidiary company, Ekco Export, Ltd., to handle the export of radio, television and car radio receivers, and electric heating and plastics products of the Ekco Group; it will be responsible for maintaining and expanding overseas manufacturing arrangements. Mr. T. C. Cleveland, formerly export manager of E. K. Cole, Ltd., is director and general manager and other directors are Messrs. W. M. York (chairman), J. Corbishley and D. J. Cole, B.A., LL.B.

The new company will operate from the main Ekco Works at Southend-on-Sea and a personal exports department and showroom for radio and television receivers will be opened at 41-47, Old Street, London, E.C.1. The export sales department of E. K. Cole, Ltd., at 5, Vigo Street, London, W.1, has been transferred to Southend-on-Sea.

Computer Centre

The computer room of Barclays Bank new Computer Centre in Drummond Street, London, seen through the glass screen of the viewing room. A 36ft G.E.C. cold cathode recessed lighting fitting can be seen in the left foreground, but was unlit for the purpose of this photograph. The electrical installation was carried out by Barlow & Young, Ltd.

Main and Sub-Contractors

LAST March a conference took place between representatives of main contractors and sub-contractors in the building industry with the object of securing improvements in methods of liaison and communication between main and sub-contractors. A report on the results has now been published by the London Master Builders' Association, 47, Bedford Square, London, W.C.1 (price 2s 6d). One important conclusion reached by the conference was that a standard form of invitation to tender should be available to sub-contractors, giving them all relevant data and asking them for particulars of timing of work.

Full information should be given by the architect to the main contractor about the sub-contractors to enable him to prepare his tender realistically. Procedure to be followed after the acceptance of a tender is also suggested in the report. Other matters dealt with are site meetings and supervision, management training of supervisors, attendance and facilities, storage and handling, and safety and welfare.

On the subject of power on site it is mentioned that the increasing use of 110 V systems is necessary to ensure that temporary wiring involving long runs is adequate; the installation of a ring main may be desirable. Heavier power requirements (for welding, cranes, etc.) should be specified by the sub-contractor in returning the standard form of invitation to tender.

At a cost of over £13,000 the A.E.I. Lamp & Lighting Co. have relighted three cotton mills in Bolton owned by Fine Spinners & Doublers, Ltd. Over 1,300 fittings, each housing a 5ft 80 W 3,600°K white tube, have been installed

Oldbury Tenders

Tenders for the construction of the 550 MW nuclear power station at Oldbury-on-Severn were received by the Central Electricity Generating Board last Tuesday.

The Nuclear Power Group announce that their tender provides for a concrete reactor vessel. The design being submitted has two reactors, each enclosed in a pre-stressed concrete pressure vessel. The Group claim that such a design can be regarded as the precursor of larger and cheaper reactors of this type in the future.

Electrolux Workers to be Dismissed

About 240 of the 1,850 employees at the Luton works of Electrolux, Ltd., are to be dismissed at the end of the month. The cause is said to be a reduction in sales following upon credit restrictions accentuated by the Chancellor of the Exchequer's recent measures.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £231 0s 0d
Fire Refined 99·70%	ton £230 0s 0d
Fire Refined 99·50%	ton £229 0s 0d
COPPER Tubes ..	lb 2s 3⅜d
Sheet	ton £265 5s 0d
H.C. Wire and strip	ton £282 15s 0d
LEAD, English ..	ton £64 10s 0d
Foreign	ton £63 0s 0d
MERCURY	flask £64 0s 0d
TIN, block (English) ..	ton £9[illegible]6 10s 0d
ZINC, G.O.B. Foreign	ton £[illegible]6 15s 0d
BRASS Tubes (solid drawn)	lb 1s [illegible]¾d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 2d
PLATINUM	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 24¾d—25d

Transistor Companies Sold

Philco Corporation of Philadelphia has sold its minority interest in Semiconductors, Ltd., Swindon, to the Plessey Co., Ltd., says a joint announcement. By this transaction Semiconductors, Ltd., becomes the wholly-owned subsidiary of Plessey and continues as a non-exclusive licensee of the Philco Corporation with respect to the manufacture and sale of transistors.

It is also reported that Associated Transistors, a company jointly formed in May, 1958, by Automatic Telephone & Electric, English Electric, and Ericsson Telephones, has been sold to Mullard, Ltd.

G.E.C. EXHIBITION

What is claimed to be the first public exhibition of colour television will be the principal attraction of an exhibition being staged by the General Electric Co., Ltd. This begins at the New Horticultural Hall tomorrow (Saturday) and will remain open to the public until next Thursday, 24th August, from 10.30 a.m. to 9 p.m. each day, including Sunday.

Apart from colour television the company will be exhibiting its radio and television sets and other divisions of the group will also have displays to demonstrate the wide range of G.E.C. activities.

PRICE REDUCTIONS

The British Central Electrical Co., Ltd., announce reductions in the prices of their "Briticent" 3-phase miniature circuit-breakers, due to increased demand and improved production methods. The new prices of the models affected are:—Type "BD Plug-in," £2 10s 4d; Type "BD Protected," £2 19s 8d; Type "KD," £2 2s 4d; Type "KLP," £2 5s.

Crompton Parkinson, Ltd., have announced substantial price reductions, in certain cases as much as 20 per cent, in their "New Range" commercial and industrial lighting fittings.

Snowy River Contracts

A contract for eight high-head Francis turbines, aggregating over one million b.h.p., to be installed in the Murray I station of the Snowy River hydro-electric undertaking has been placed with Boving & Co., Ltd. The generators for this 760 MW station are to be provided by A.S.E.A. (Sweden) and transformers (to be built in Canada) will be provided by the Australian General Electric Co.

Here are 'R' Tapes

Glass reinforced silicone elastomer tapes—cured on one side, semi-cured on the other—can be bonded by application of heat and pressure without need of additional adhesive.

A snug tough
insulation bonded by
heat and pressure only.

NO OTHER ADHESIVE NECESSARY

- * *Good thermal endurance and electric strength* (CLASS H)
- * *Tracking and corona resistant*
- * *Low power factor*
- * *Abrasion resistant*
- * *After final sealing 'R' tapes withstand moisture and severe weather conditions—*

a tough material for tough jobs

m and i

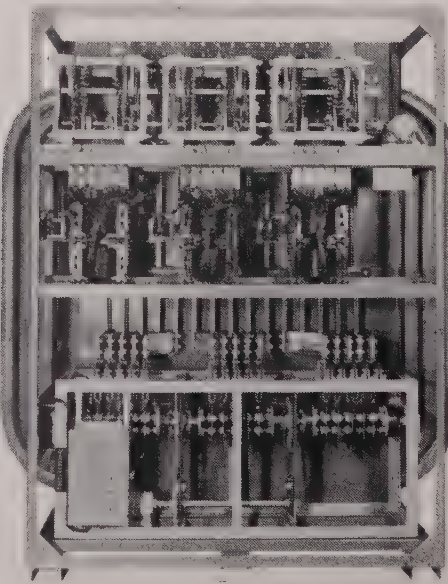
the electrical insulation people

MIC

THE MICANITE & INSULATORS CO., LTD.,
EMPIRE WORKS, BLACKHORSE LANE, WALTHAMSTOW, LONDON, E.17.
TEL: LARKSWOOD 5500 · 'GRAMS: MYTILITE, LONDON · TELEX: 25183

This furnace provided a burning question...

how to control the intense heat required for processing steel? Foster Transformers supplied the answer —as they have for other furnace equipment —a voltage regulator giving smooth control from 50 to 450 volts output, 650kVA. The Foster Voltage Regulator Section supply all branches of industry, at home and abroad, with standard and custom-built equipment manufactured at their Wimbledon Works. The most exacting demands of industry are well met by Foster Transformers.



3-Phase Voltage Regulator. Ratio 11,000/450-50 volts. Output, 650kVA. Supplied to Birlec-Efco (Melting) Ltd. of Staffordshire.

FOSTER TRANSFORMERS

South Wimbledon, London, S.W.19. Telephone: Liberty 2211. Telegrams: Fostrans, London, Telex.

M *Member of the Metal Industries Group of Companies*

Fire Research in 1960

There were some 130,300 fires in the United Kingdom attended by Fire Brigades in 1960, according to the report of the Joint Fire Research Organisation published for the D.S.I.R. by H.M. Stationery Office (5s 6d). In the period, 2,896 fires of electrical origin were reported, 44 per cent of which occurred in dwellings. The largest proportion, approximately 65 per cent, was attributed to the failure of fixed cable or flex. About 6 per cent of the fires in wire and cable were thought to have been caused by overloading and some 72 per cent by broken insulation resulting from mechanical causes, moisture, heat, chemicals or age. Work is being carried out to determine the effect on the fire incidence of the age of the installation.

THERMOCOUPLE REFERENCE TABLES

A further set of tables for converting thermocouple voltages into equivalent temperatures has been published as B.S. 1828 : 1961 "Reference Tables for Thermocouples (Copper *v.* Constantan)." Like the other tables in this series—B.S. 1826 and 1827—they are based on the International Temperature Scale 1948 and on the absolute volt which, in 1948, was adopted as the standard unit in place of the international volt. The electromotive force/temperature curve adopted as a basis for the tables is one typical of the wire supplied by British manufacturers, since it has been found impracticable for British wire makers to produce copper-nickel alloy in bulk which will give values in accordance with the tables of the United States National Bureau of Standards.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 6s.

Mechanical Handling Exhibition

The organisers state that there is an increased demand for space in the world's largest show of industrial labour-saving equipment — the Mechanical Handling Exhibition to be held at Earls Court, London, from 8th to 18th May next year. The exhibition is open to firms in any country in the world. Details can be obtained from Mr. H. A. Collman, the manager, Dorset House, Stamford Street, London, S.E.1.

One of the blast furnace switchboards for Richard Thomas & Baldwins being assembled at the works of Brookhirst Igranic

Blast Furnace Controls

TWO sets of blast furnace controls for the new Spencer works of Richard Thomas & Baldwins at Llanwern, near Newport, Monmouthshire, are now being manufactured at the Bedford works of Brookhirst Igranic, Ltd. Each set of controls consists of five open type switchboards comprising an ancillary board controlling the incoming section and distribution to small drives; charging board No. 1 with incoming section, alarm section and skip hoist; charging board with stock-line, distributor, breeze, water and coke controls; charging board No. 3 handling weighing and vibro-feeders, material programme, bell sequence and pressure; and a d.c. distribution board. In addition a clay gun cubicle is being supplied for each furnace and a common stove ventilation panel to serve both sets as well as the necessary brakes, limit switches and push-buttons.

WEST GERMAN ELECTRICAL IMPORTS

"TRADING Opportunities in West Germany" is the title of a 50-page booklet published by the Export Council for Europe, 21, Tothill Street, London, S.W.1 (5s). The chairman of the Council, Sir William McFadzean (B.I.C.C.), refers in a prefatory message to the visit of a mission, which he headed, to West Germany. He considers that "West Germany is a tremendously exciting and challenging market, particularly in the breadth of opportunity and the encouragement being given to imports." The first section of the survey is headed "The Open Door" and it shows that although West German imports rose by 19·1 per cent in 1960, Britain's share remained static while competitors have seized the opportunity of increasing their trade.

Opportunities for the expansion of British exports to the Federal Republic, it is said, are to be found within every sector of the economy but special reference is made, *inter alia,* to electronic equipment and components, refrigeration equipment and scientific and measuring instruments. One point which is made is that, although the high standard of British gas and electrical equipment is recognised, modifications in our typical designs are required to meet German tastes.

Methods of stimulating imports of British goods are recommended, including reciprocal visits, participation in trade fairs, "British weeks," as well as marketing research and advertising.

About half of the booklet is occupied by tables giving the importation into Germany of selected items with figures of the shares of the leading suppliers. Those dealing with imports of electrical machinery and equipment indicate that on the whole the British contribution compares unfavourably with that of other countries. In only one of the 13 classes included—primary cells and batteries—does this country lead. It is noteworthy, however, that in the case of some domestic appliances there was a substantial proportional increase in 1960. This is true also of generators and motors.

Ford Merseyside Factory

All electric motors for the new Ford factory at Halewood, on Merseyside, are to be made by A.E.I. The value of orders obtained for this factory total £167,000.

INDUSTRIAL NEWS *[continued*

LIGHTING OF THE U.S.A. TRADE CENTRE

Well-lighted display at the Trade Centre

IN the Trade Centre recently opened by the U.S.A. Department of Commerce in St. James' Street, London, lighting plays an important part in creating a pleasant and impressive atmosphere.

General lighting in the offices and showrooms is provided by fluorescent lamps whilst emphasis on the American merchandise displayed is given by tungsten lamps. The general illumination in the reception area is provided by recessed modular fittings, each housing warm white fluorescent lamps. On the wall facing an incoming visitor is a large outline map of the United States. Recessed in the panelled wall are a number of coloured transparencies of American beauty spots, lighted by 22 W, 8¼in diameter circular fluorescent tubes.

In the showrooms the general illumination is provided by recessed modular fittings, each housing four 5ft 80 W warm white fluorescent lamps. Important items are highlighted by 150 W pressed glass spot lamps housed in end-mounted adjustable and easily-removable fittings.

The offices on the third floor are illuminated by twin-lamp "Streamlite" channel fittings with acrylic diffuser attachments.

The equipment was supplied and the electrical installation carried out by the Auto Call Company, Parker Street, London, W.C.2.

VISUAL MATHEMATICAL AIDS

An illustrated full-colour 44-page booklet has been produced by A.E.I. (Manchester), Ltd., on visual aids which have been designed to give an understanding of simple arithmetical, algebraical and geometrical relationships. Copies of the booklet can be obtained from the Education Manager, Group Personnel Services, Associated Electrical Industries (Manchester), Ltd., Trafford Park, Manchester, 17.

Works Accident Records

The Royal Society for the Prevention of Accidents has just published "Works Accident Statistics, Part 2: Records and Analysis," a comprehensive pamphlet which gives information on how to establish a satisfactory accident recording system, how to prepare statistics from those records, and how to present them in a clear and concise manner. The price is 5s post free (members 3s 9d), and orders should be addressed to the Service Department, RoSPA, 52, Grosvenor Gardens, London, S.W.1.

ELECTRICITY IN THE FOUNDRY

The Midlands Electricity Board (Wolverhampton Area) informs us that a conference on electricity in the foundry is being arranged to take place in the Wulfrun Hall, Wolverhampton, on 10th and 11th October. Papers will be presented on arc, induction and "malleabilising" furnaces; tariffs, power factor and load factor; materials handling and automation; and amenities.

Home and Export Orders

THE West Midlands Division of the National Coal Board has placed an order with the A.E.I. Heavy Plant Division for a 1,840 h.p. single-drum a.c. winder for Victoria Colliery, near Stoke-on-Trent. Winder control will be obtained by the use of rotor contactor gear and metallic resistances instead of the more conventional liquid controller. Two of the main advantages of the control system to be used are, firstly, that since no mechanical linkages are involved, the control equipment can be installed wherever space is available, and secondly, that very little maintenance is required. Another interesting feature of this installation is that the winder motor will be wound for a 2,500 V supply but can be re-wound for 3,300 V when the supply is altered.

Dewrance & Co., Ltd., have secured the contract for the heat exchanger mountings and steam and feed pipeline valves for the Sizewell nuclear power station.

Metal Industries (Europe) S.A. (Metal Industries Group) has secured an order, through its office in The Hague, for the complete electrical equipment of eight harbour cranes for the Amsterdam Harbour Board at a cost of nearly £50,000. Control panels will be manufactured by Brookhirst Igranic and the motors by Lancashire Dynamo & Crypto. The cranes are being supplied by a German firm.

Communication equipment valued at £120,000 is to be supplied by the A.E.I. Electronic Apparatus Division for the new Spencer steelworks of Richard Thomas & Baldwins.

Trade Announcements

The business of **Kelvin & Hughes, Ltd.,** a subsidiary of S. Smith & Sons (England), Ltd., has been transferred to the parent company. The Barkingside factory now forms part of a new Kelvin Hughes Division; the Basingstoke factory part of a new Aviation Division; and the Hillington factory part of the existing Industrial Division.

Midland Silicones, Ltd., have moved their Birmingham sales office to new and larger premises at Lichfield House, Smallbrook, Ringway, Birmingham, 5.

Polypenco, Ltd., have appointed two additional sales engineers. Mr. J. Brunwin will cover the Southern Counties and Mr. John Palmer the East and West Midlands.

Sunbeam Electric, Ltd., has opened a service station and sales showroom at 37, Chichester Street, Belfast.

Stray Load Drag Loss of Induction Motors

COMPARISON OF MEASURED TORQUE/SPEED CHARACTERISTIC WITH THAT CALCULATED FROM THE CIRCLE DIAGRAM

By **O. E. MAINER**, M.Sc.Tech., M.I.E.E.* and **J. R. EDWARDS**, D.F.H., Graduate I.E.E.*

The purpose of this investigation is to draw attention to the importance of the stray load drag loss, which is responsible for a large discrepancy between the measured brake torque and that calculated from the circle diagram or equivalent circuit. The authors show that this discrepancy is very noticeable while a three-phase induction motor is accelerating from standstill

If an induction motor is directly switched on to the mains, very heavy currents flow during the starting period and rapid acceleration is essential to prevent excessive overheating of the windings. In these circumstances, special techniques have to be devised for determining the relationship between speed and torque. In this investigation, the motor was fed with about one-third its rated voltage and it was then found that the complete load torque/speed curve could be determined accurately without the standstill current appreciably exceeding 200 per cent full load. The tests described might well be carried out by students at post-H.N.C. or honours degree level.

The motor tested was an educational machine with special facilities for inserting and removing a number of different rotors. The test curves illustrated refer to the following rotors:—Wound slip-ring, standard cage, low-loss cage, and high-torque double cage.

The rotor of the induction motor was mechanically coupled to the armature of a d.c. shunt machine (dynamometer) which had the field system swung on bearings concentric with those of its rotor and constrained by two spring balances at a radius of one foot. The d.c. machine served for both braking and driving the induction motor, so that the latter could be run at any required speed in either direction.

Loss Torques

The loss torques of a three-phase induction motor are (1) the friction and windage torque and (2) the drag on the rotor due to iron losses set up by slot frequency variations in the gap flux. The friction and windage torque was measured over the full speed range by using the d.c. dynamometer to drive the motor and is depicted by curves 1 in each section of Fig. 1.

The drag loss is divisible into two parts:—(a) The loss due to slot frequency variations in the main gap flux. This loss is independent of the load and is usually relatively small. The method of measuring this loss is described by Say.[1] This loss is roughly proportional to the square of the applied voltage. In this investigation, the applied voltage was reduced to about one-third of the rated value so that this loss was negligible. (b) The loss due to slot frequency variations in the zig-zag leakage flux set up across the gap by the opposing stator and rotor m.m.f.'s. This is a stray load loss and varies in proportion to the square of the current and probably (speed)$^{1\cdot5}$.

Stray Load Loss Test

The second part of the drag loss, mentioned above, is measured by the reverse rotation test. The importance of the stray load drag loss is recognised by the A.I.E.E.,[2] who confirm the validity of the "reverse rotation test"[3] when used in conjunction with Ware's "removed rotor test" for the evaluation of this loss.[4] Pertinent comments on this matter with reference to B.S. 269 have been made by Barton and Ahmad.[5]

In this investigation the induction motor was driven by the dynamometer not simply at reversed synchronous speed, but at a series of reversed speeds from synchronism down to standstill. During the test, a much reduced voltage was applied to the stator, and this voltage was adjusted at each speed to circulate 140 per cent full-load current.

The dynamometer registers the total torque due to friction and windage, gap power and stray load drag loss. The gap power P_g is given by

$$P_g = \left(\begin{array}{c}\text{stator input measured by}\\ \text{two-wattmeter method}\end{array}\right) - (\text{power loss in stator})$$

As the flux for reversed rotation is very small, the stator fundamental iron loss can be neglected and the power loss in the three-phase stator may be taken to equal $3\ I_1^2 r_{1e}$, where I_1 = stator phase current and r_{1e} = effective stator resistance. The stator power loss is determined in accordance with Ware's test by removing the rotor and measuring the electrical input to the stator for

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* Royal Military College of Science, Shrivenham.

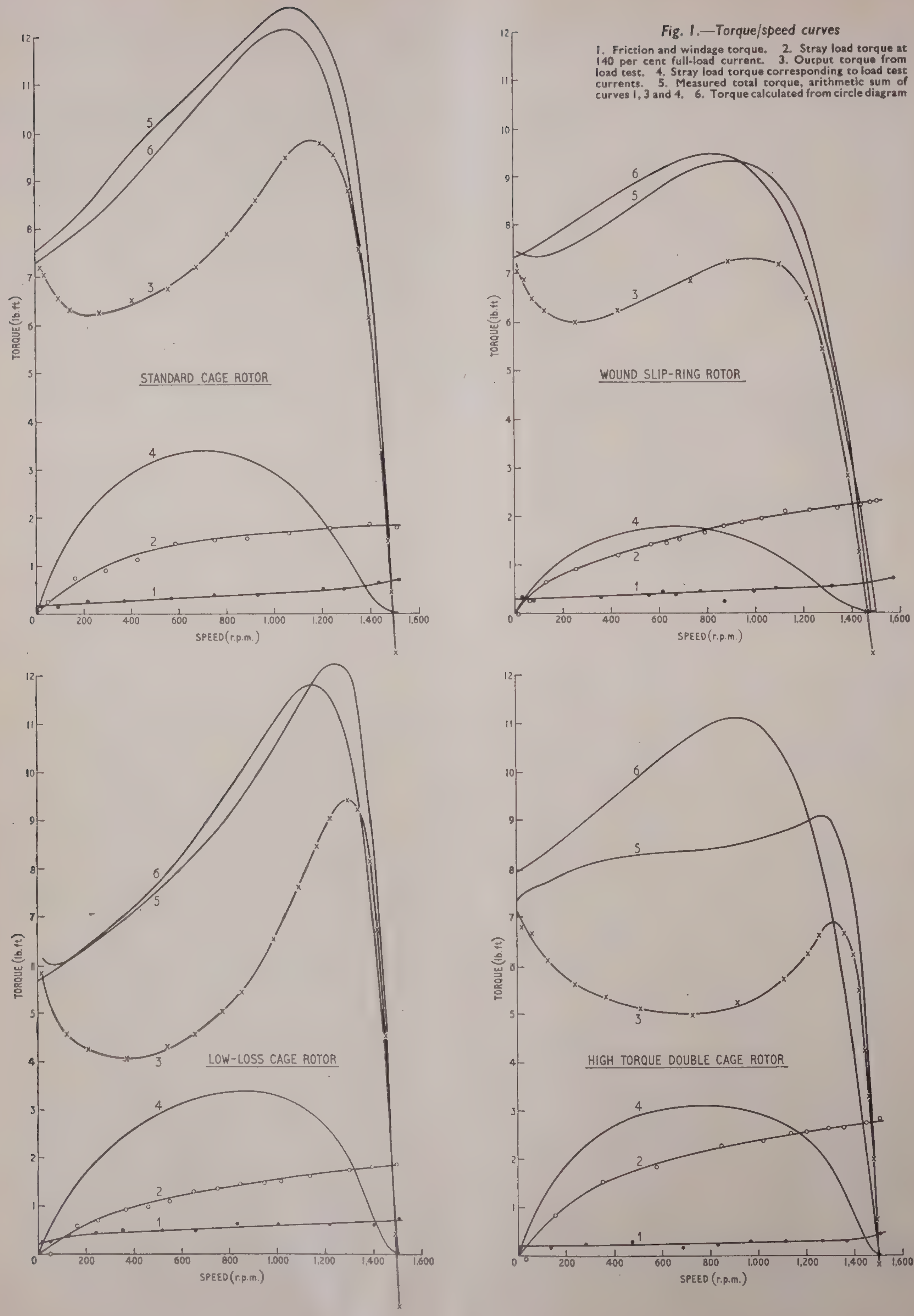

Fig. 1.—Torque/speed curves

1. Friction and windage torque. 2. Stray load torque at 140 per cent full-load current. 3. Output torque from load test. 4. Stray load torque corresponding to load test currents. 5. Measured total torque, arithmetic sum of curves 1, 3 and 4. 6. Torque calculated from circle diagram

the value of current (140 per cent full load) used in the reversed rotation test.

The torque due to the gap power is given by $T_g = \frac{P_g}{\omega_o}$ where ω_o is the synchronous speed. On deducting the gap torque and the friction and windage torque from the dynamometer torque, the stray load torque is obtained. This torque is depicted by curves 2 in Fig. 1.

At low speeds, the stray load torque becomes a small difference of relatively large quantities, and at very low speeds the friction torque is a rather uncertain quantity. Also the power loss in the stator as given by Ware's test is likely to vary somewhat due to changes in the temperature of the stator winding. All these factors combine to make it difficult to obtain accurate values of the stray load torque near standstill. Accordingly, in this region, the curves 2 have been drawn so as to pass through the origin irrespective of the experimental points.

It is of interest to note that when the stray load torque, as represented by curves 2, is plotted on log-log paper, points below 100 r.p.m. being ignored, straight lines are obtained, which means that the stray load torque is proportional to $(\text{speed})^x$. The stray load drag loss is then proportional to $(\text{speed})^{1+x}$. The figures for the index $1+x$ are given in the table.

Table showing the speed index for various types of rotor

Type of rotor	Stray load loss speed index, $1+x$
Wound	1·54
Standard cage	1·46
Low-loss cage	1·56
Double cage	1·47

These values of $1+x$ may be compared with the recommendation of Barton and Ahmad[5] that the stray load loss should be assumed to vary as $(\text{speed})^{1\cdot5}$.

Load Torque/Speed Test

With the dynamometer machine used as a brake, the complete characteristic of speed against load torque was determined at one-third rated voltage. Curves 3 show the characteristics of the different rotors.

Calculations

To evaluate the stray load loss during the load test, readings of stator current were taken during this test. Corresponding to these values of load current the stray load torque at any speed was determined by multiplying the ordinates of curve 2 by the ratio $\left(\frac{\text{load test current}}{140\% \text{ full-load current}}\right)^2$ In this way curves 4 were obtained. The sum of the output torque, 3, the stray load torque, 4, and the friction and windage torque, 1, gives the measured total torque shown by curves 5.

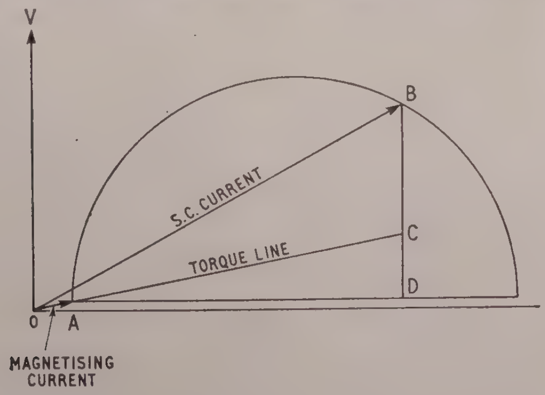

Fig. 2.—Circle diagram

Circle Diagram.—To draw the circle diagram, Fig. 2, it is necessary to determine the "true no load" or magnetising current O A. This is obtained by using the dynamometer machine to drive the induction motor forward at synchronous speed. The short-circuit current O B is that occurring at standstill during the load test. The torque line A C is obtained by making the ratio

$$\frac{CD}{BD} = \frac{\left(\begin{array}{c}\text{Stator loss in}\\ \text{Ware's test}\end{array}\right) \times \left(\frac{\text{Standstill current}}{\text{Ware's test current}}\right)^2}{\text{Standstill loss}}$$

When a slip-ring rotor was used, opportunity was also taken to measure the rotor standstill current. Subsequently the removed rotor was excited and the loss for the same current measured. It was found that the sum

$$\left(\begin{array}{c}\text{Loss in removed}\\ \text{rotor}\end{array}\right) + \left(\begin{array}{c}\text{Loss in removed}\\ \text{stator}\\ \text{(Ware's test)}\end{array}\right) = \left(\begin{array}{c}\text{Normal standstill}\\ \text{short-circuit loss}\end{array}\right)$$

This appears to confirm the validity of Ware's test as a means of determining the stator short-circuit loss.

The total torque calculated from the circle diagram evaluated in the above manner is shown by curves 6 and shows reasonable agreement with the measured total torque in the case of the wound, the standard cage and the low-loss cage rotors. As might be expected the agreement in the case of the double-cage rotor is poor, because the assumption that the current locus is a circle is in this case far from true.

Temperature Variation

To minimise variations in the stator and rotor resistances due to temperature changes, each series of tests was preceded by a two-hour heating-up period at full-load current. Each series of tests was then carried out in the following order:—Load test at decreasing speed down to standstill, no-load test, friction and windage test, reversed rotation test, Ware's test.

It should, however, be realised that during the reversed rotation test at 140 per cent full-load current, the temperature of the stator winding must increase appreciably. It follows that the value of the effective stator resistance determined by Ware's test cannot give an exact value of the stray load loss over the whole speed range. In short, curves 2 cannot be exact. This applies equally to curves 4 which are derived from curves 2. However, it is considered that the errors due to change in stator resistance caused by temperature rise will have been small.

Relative Torque Values

As the stator and rotor leakage reactances are reduced somewhat by saturation of the leakage flux paths, the initial starting current and torque will increase more than proportionally to the square of the voltage. The stray load torque will increase to a smaller extent, but will nevertheless amount to an appreciable part of the developed torque. On the other hand, the friction and windage torque will remain unchanged and will then be of little consequence.

Summary

It has been assumed in this investigation that the stray load drag loss is proportional to the square of the load current, because it is considered that this hypothesis is generally accepted. The investigation confirms the recommendation of Barton and Ahmad that the stray load drag loss is proportional to (speed)$^{1\cdot5}$.

The investigation has also shown that if the torque/speed curves at reduced voltage are plotted over the entire speed range from standstill to synchronism, reasonable agreement between measured values of torque and those evaluated from the circle diagram can be obtained only if allowance is made for the stray load torque.

It has been pointed out by Carr[6] that at rated voltage saturation of leakage flux paths causes the starting current and starting torque to be appreciably higher than might be expected from s.c. tests at reduced voltage. This same saturation of leakage paths must also prevent the stray load torque increasing in proportion to the square of the current. It follows that if the stray load torque is ignored calculations based on the equivalent circuit or circle diagram are not bound to give unduly optimistic figures for the "direct-on" starting performance of three-phase induction motors. For motors started with reduced voltage this investigation shows that stray load torque cannot be ignored.

The authors wish to thank the authorities of the Royal Military College of Science for facilities made available and for permission to publish this paper.

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DUST-TIGHT ELECTRICAL APPARATUS ENCLOSURES

THERE is no British Standard for electrical equipment for use where inflammable or explosive dusts may be found. Such situations are encountered in a wide variety of industries because many dusts, in addition to the recognised explosives, are inflammable to some extent, depending on the particle size, dust density, etc. A list of about 180 such dusts, which names only those which have been tested and is therefore not exhaustive, is published by the Factory Department of the Ministry of Labour and National Service. Some organisations, e.g. the Explosives Storage and Transport Committee, have laid down their requirements for dust-tight electrical apparatus, but there has been a growing need for a British Standard and as a result the B.S.I. has set up a committee for its preparation.

The Electrical Research Association was asked to assist in this preparation and to investigate some aspects of the problem experimentally. The report, Ref. D/T118, "Dust-Tight Enclosures for Electrical Apparatus: Examination of a Proposed Method of Test," by H. G. Riddlestone and R. W. Coram, price 10s 6d, describes the work carried out on a test for dust-tightness which the B.S.I. Committee think will prove suitable and discusses the features which have been found to be important. Other hazards involved in using electrical apparatus in dusty atmospheres, such as overheating due to surface dust layers, or thermal ignition of such layers, are not considered.

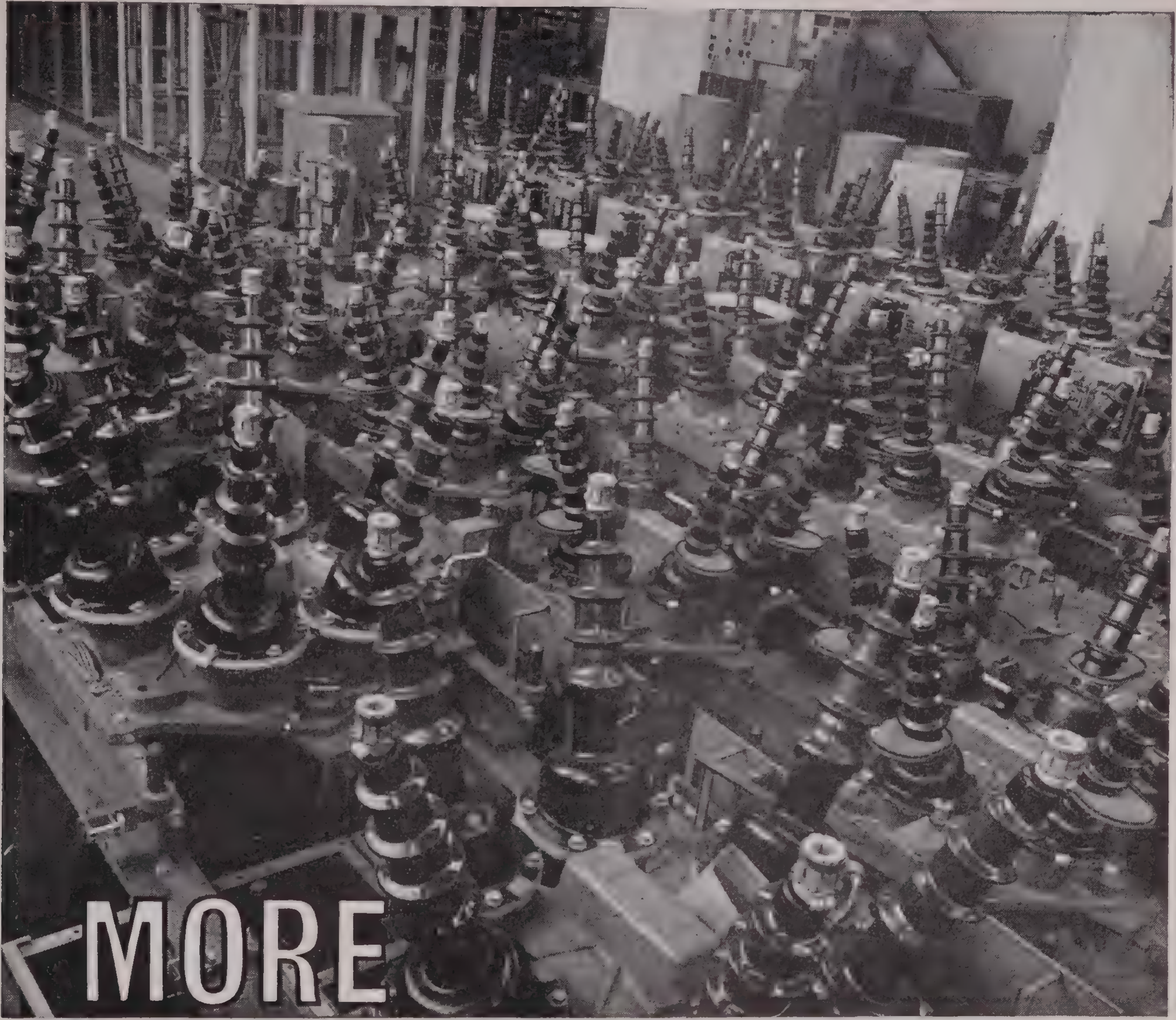
Two further reports have been published concerning intrinsically safe apparatus and dealing with the relationship of igniting current to circuit inductance for mixtures of diethyl ether vapour (report Ref. D/T120) and acetylene (report Ref. D/T121) with air. Both are by P. B. Smith and N. L. Heathcote, and are priced at 4s 6d each. The investigations described in these reports are part of a series which are being carried out at the Safety in Mines Research Establishment to determine the relative ease of ignition by break-sparks of the various inflammable gases and vapours used in industry, in order to group them and to choose the representative gases and vapours for test purposes. Diethyl ether is commonly used as a solvent and an anæsthetic. For purposes of flameproof protection it is placed in Group IIIa of B.S. 229. The report dealing with acetylene presents a redetermination of the minimum igniting currents previously given in report Ref. D/T108.

Copies of these reports are available at the prices indicated from the Publications Sales Department of the E.R.A. at Cleeve Road, Leatherhead, Surrey.

Airfield Lighting Fittings

ALL British Standard Specifications for lighting fittings for use at civil land aerodromes are now being published as sections of one British Standard: B.S. 3224. Accordingly, the British Standard bearing this number (High-intensity elevated runway-lighting fittings) has been renumbered: B.S. 3224: Section D1. Three more sections of Part D have now been published:—Section D2: Omni-directional elevated runway-lighting fittings; Section D6: High-intensity elevated runway-threshold lighting fittings; and Section D7: Omni-directional elevated runway-threshold lighting fittings. They specify requirements and test for the photometric performance and the essential mechanical and electrical features (excluding lamps) for the respective fittings. These fittings are suitable for use on systems with a maximum of 50 V r.m.s. to earth. Guidance on the use of these fittings is given in B.S. 1332, "Guide to civil land aerodrome lighting."

Copies of these parts may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 4s 6d each.



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Scottish Pumped Storage Station

PLANT FOR THE LOCH AWE SCHEME

LAST week we reported that orders had been placed by the North of Scotland Hydro-Electric Board for four pump/turbine generator/motor units for the underground generating station at Cruachan in Argyllshire which is part of the Loch Awe project. This generating station will be the first major Scottish pumped storage scheme and also the largest installation of its kind in the world. The consulting engineers for the electrical and hydraulic plant associated with this station are Messrs. Merz & McLellan, while contracts for two generating sets each have been awarded to Associated Electrical Industries, Ltd., and the English Electric Co., Ltd.

During the night the turbines will work as 142,000 h.p. pumps, using surplus power to lift the waters of Loch Awe to a storage reservoir 1,200ft above on Ben Cruachan. When the machines are operating as turbines a total of 400 MW will be developed to meet daytime peak demands. This is believed to be the first time that a head of over 1,000ft has been used for a single-stage reversible pump turbine.

The English Electric equipment, consisting of two 142,000/136,500 h.p. reversible pump/turbines and two 111 MVA motor/generator units, with the governors and 80-ton valves, will mainly be made at the Scotstoun Works of Harland & Wolff, Ltd. The development of the reversible pump turbines has been carried out by the English Electric Co., Ltd., at Netherton and Rugby in collaboration with Sulzer Bros.

The A.E.I. electrical equipment, consisting of generator/motors, voltage regulating equipment and control apparatus, will be manufactured at the group's Rugby and Glasgow factories. The two pump/turbines have been sub-contracted to Boving & Co., Ltd.

The A.E.I. informs us that in each of its 500 r.p.m. vertical machines a single-thrust bearing in the upper bearing housing is designed to take the weight of the rotor, the hydraulic runner and the hydraulic thrust. There is also a top guide bearing in the upper bearing housing and a second guide bearing is mounted below the rotor. The thrust bearing will be of the "spring mattress" type provided with pressure lubrication for starting.

A closed-air-circuit ventilation system will serve each machine, the air being cooled by air/water heat exchangers mounted on the stator frame. To obtain the maximum cooling efficiency, external motor-driven fans will be used to circulate the air through the machines, since fans mounted on the rotor are relatively inefficient when designed to rotate in both directions.

The stator core will be built up of laminations of a recently-developed low-loss cold-reduced sheet steel which has a surface finish superior to that of hot rolled material which makes it easy to build a very tight and uniform core. The stator coils will be insulated with mica tape bonded with a modified epoxy resin, a type of insulation used abroad but so far not used on machines of this size in Britain. Its advantage lies in its ability to withstand the effects of differential expansion resulting from the frequent starting-up and shutting-down inherent in pumped storage installations.

For operation as a pump motor each machine will be started by an a.c. pony motor mounted on the shaft. This method of starting restricts the starting current to less than a quarter of the full-load current, thus avoiding the difficulties associated with violent load variations on the supply lines.

The rotors of the electrical machines will be built up of thin punched sheet steel segments thus ensuring a homogeneous rotor body and facilitating erection on site. It is stated that these machines will be the first large hydro-electric units operating at 500 r.p.m. to have this type of rotor construction.

THE DRAGON REACTOR

THE O.E.E.C. European Nuclear Energy Agency has just published the second annual report of its steering committee on the "Dragon" high-temperature reactor project at Winfrith, Dorset. The principal aims of the Dragon Project, which was set up under a five-year 12-nation agreement in 1959, are to design, build and operate a 20 MW high-temperature gas-cooled reactor experiment, and to carry out a programme of research and development to explore the practical possibilities of this reactor type, and the technical problems (particularly in connection with core construction and fuel) resulting from operation with temperatures in the neighbourhood of 1,500°C in the core.

The first annual report included details of the history and structure of the project together with a broad survey of its technical objectives, as well as an account of the first year's work. The second report is confined to a record of progress during the year under review. It is in three sections of which the first two "Research and Development" and "Reactor Design and Construction" cover in detail the progress of work in the two technical divisions of the project. The remaining section deals with staff and contractual matters, finance, information, patents, etc.

The report refers to the rapid progress made with the construction work on the reactor experiment; the completion of a great deal of the detailed technical design; the large numbers of research and development problems being studied; and an agreement in principle that the enriched uranium for the Dragon's first fuel charge shall be supplied by the United Kingdom Atomic Energy Authority.

Financial Section

STOCKS and SHARES

FOR a few days after the passing of the new Trustee Act, the divergent course of prices in the gilt-edged and industrial markets showed that trustees in fairly large numbers were deciding to take precipitately their first opportunity to transfer up to 50 per cent of the funds under their care into ordinary shares. Their activities subsided very quickly, however. War Loan, which had been forced down almost to 50, recovered about 2 points and industrials gave up gains which had amounted in many cases to several shillings. The Act may be expected to remain as an influence upon investment trends for a long time to come, but anything like a mass migration from the gilt-edged to the equity markets seems very improbable in present circumstances.

Trustee Equities

Among the trustee's problems is the difficulty of switching from gilt-edged stocks to ordinary shares without losing income in the process, but in this respect at least matters have been made easier by the fall in share prices over the past three months. Among the electrical and engineering shares which appear to have the qualifications required by the Act, A.E.I. are now available to yield over 8 per cent, while on the basis of the last-paid dividends, returns of between 6 and 7 per cent are shown by, among others, English Electric, G.E.C., Westinghouse, Allen West and Babcocks. In the 5 to 6 per cent range of yields come Crompton Parkinson, Hoover, Lucas, Aberdare and Bowthorpe; and the 4 to 5 per cent bracket includes such issues as B.I.C.C., E.M.I., Brook Motors, Parsons and Reyrolle.

Lower Returns

Shares such as Elliott-Automation, I.C.T., Thorn Electrical and Ward & Goldstone are reckoned to comply with the specifications laid down for the investment of trust funds, but yields at present rates of dividend may be too low for consideration by funds other than those interested more in growth than present income. On none of them is the yield as much as half the 6·8 per cent return on War Loan at its present price. In the case of many "dated" gilt-edged issues, such as the two 3 per cent British Electricity stocks, current yields are in the neighbourhood of 4½ per cent, and less difficult therefore to replace, but a sale now means forgoing guaranteed capital recoveries of 30 points or more.

Fluctuations

Price changes over two weeks are marked in the accompanying tables. As a net result of the many sharp fluctuations which occurred in this period, many electrical shares finished on the right side, with particularly big net recoveries in Decca, Dimplex, Hoover, Chloride Electrical, B.I.C.C., and Reliance-Clifton; and useful gains

Price Changes in

Company or Board	Nom. Value	Middle price 14th Aug.	Two Weeks' Rise or Fall	Dividend Pre-vious	Dividend Last	Yield %	1961 High-est	1961 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71½	−½	3	3	4 4 0	75½	70½
Brit. Elec. 1974/77	100	65½	−½	3	3	4 11 6	70½	64½
Brit. Elec. 1976/79	100	68	−1	3½	3½	5 3 0	73½	67
Brit. Elec. 1974/79	100	77	−1	4¼	4¼	5 10 6	82	76
Brit. Elec. 1967/69	100	86½	−½	4½	4½	5 4 0	91½	86
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		7†	7½†	11 12 0	23/3	20/6
East African Power	£1	13/3		8	10	15 2 0	15/-	13/-
Nigerian Elec.	£1	18/6	+6d	8	10	11 2 0	19/9	15/6
Perak Hydro-Elec.	£1	21/3	−1/3	10	10	9 8 3	23/6	17/6
Electrical Shares								
Aberdare Holdings	5/-	15/3	+3d	17½	17½	5 14 9	17/-	14/3
Aerialite	1/-	5/-		54	54	12 0 0	8/-	4/6
Allen, W. H.	£1	30/-	−1/3	14	10*	6 13 3	42/6	30/-
Allied Insulators	5/-	8/3		20	10*	6 1 3	10/-	8/3
Alwyn Holdings	5/-	19/6	−9d	12½	15‡*	3 17 0	22/3	16/6
Anglo-Portuguese Tel.	£1	19/3	−1/-	9	9	9 7 0	25/-	18/9
Arcolectric	1/-	5/3		15	15	2 17 3	6/-	3/9
Aron Meters	5/-	19/-	+6d	15	15	3 19 0	18/6	17/-
Assoc. Elec. Ind. Ord.	£1	35/6	−6d	15	15	8 9 0	48/6	35/6
Automatic Tel. & El.	5/-	16/6	+1/9	17	17	—	20/6	12/9
Babcock & Wilcox	£1	27/-	−1/-	9	9	6 13 3	36/6	27/-
Bakelite	10/-	43/9	−2/6	17½	17½*	4 0 0	60/-	42/-
Baldwin, H. J.	2/-	1/3	−3d	10	Nil	—	1/9	1/3
Berry's Electric	5/-	50/-	+2/6	30	33⅓*	3 6 9	52/6	37/-
Bowthorpe Holdings	2/-	7/9		18½	22	5 13 6	10/3	7/9
Brit. Elec. Resistance	2/-	7/-		17½	17½*‡	5 0 0	8/9	6/6
Brit. Elec. Traction:								
Def. Ord. "A"	5/-	48/-	+1/6	40	50	5 4 3	57/6	41/9
Brit. Electronic Ind.	5/-	10/-		—	15‡	7 10 0	15/3	9/9
B.I. Callender's	£1	58/3	+3/3	13½	13½	4 12 9	62/3	49/6
B.I. Callender's 6% Pref. ...	£1	16/6		6	6	7 5 6	18/3	16/6
British Thermostat	5/-	30/-	+6d	20	27½	4 11 9	40/-	28/-
Brook Motors	10/-	55/-	+1/6	25	25*	4 11 0	55/-	47/-
Bulgin, A. F.	1/-	11/3	+6d	55	40*	3 11 0	12/3	7/9
Bulpitts	5/-	18/-	+3d	15	16¼	4 10 3	27/6	16/9
Burco Dean	5/-	6/3		18	15	12 0 0	11/9	6/3
Cable & Wireless	5/-	18/3	+1/6	10	10*‡	2 14 9	19/9	12/6
Cambridge Instruments	5/-	32/-	+1/6	12½†	22	3 8 9	38/6	30/-
Chloride El. Storage "A" ...	£1	82/6	+5/-	17½	20	4 17 0	91/-	72/-
Clarke Chapman	£1	40/-		13¾	13¾	6 17 6	54/-	40/-
Clarke, T.	2/-	4/-		16	16	5 6 9*	5/3	3/6
Combined Elec. Mfrs.	4/-	7/-		—	12½	7 2 9	10/-	7/-
Contactor Switchgear	5/-	12/9	−3d	14	14	5 9 9	16/-	12/9
Cossor, A. C.	5/-	7/6		Nil	Nil	—	8/-	5/6
Crabtree	10/-	25/-		20	12½*	5 0 0	33/9	25/-
Crompton Parkinson	5/-	11/9		14	12½*	5 6 6	14/6	11/3
De La Rue	10/-	55/-	+2/6	22½	22½*	4 1 9	70/-	52/6
Decca "A"	10/-	62/-	+4/6	20	23⅓	3 15 0	70/-	52/3
Desoutter	5/-	57/6		30	35	3 0 9	68/9	49/-
Dewhurst	2/-	5/-	+9d	20	20	4 0 0*	6/6	3/9
Dictograph Tel.	2/-	10/9		20	20*	3 14 6	13/-	8/6
Dimplex	5/-	73/6	+6/-	—	30	1 14 0*	79/-	47/-
Dubilier Condenser	1/-	2/-	−3d	30	15*	7 10 0	3/-	2/-
Duport	5/-	11/6		17½	20	5 15 9*	17/-	11/3
E.M.I.	10/-	38/3	+1/-	20	17½*	4 11 6	51/3	36/9
Eleco	2/-	7/9	−3d	20	20	2 11 6*	10/6	4/3
Electrical Apparatus	5/-	19/-		14½	20	5 5 3	21/-	17/-
Electrical Components	5/-	8/-		11½	12½	7 3 9	9/9	8/-
Elec. Construction	£1	22/-		9	5	4 11 0	39/-	22/-
Elliott-Automation	5/-	34/6	+2/-	9·3	13	1 17 9	37/6	25/6
Enfield Rolling Mills	£1	40/6		15	15	7 8 3	51/6	40/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

in I.C.T., Elliott-Automation, E.M.I., Ward & Goldstone and others. Among the lower-priced shares, Newman Industries, Allen West, Dewhurst and Radio & Television Trust were prominent. In the case of the last-named, the chairman's report of rising output and profits in the current year was a factor. Metal Industries rose from 50s to over 60s, reverting later to 56s 3d, on consideration of the annual results. Dealings began at prices around 2s 9d in the newly introduced 1s shares of Carbon Electric Holdings.

Electrical Investments

Company or Board	Nom. Value	Middle price 14th Aug.	Two Weeks' Rise or Fall	Dividend		Yield %			1961	
				Previous	Last				Highest	Lowest
Electrical Shares—continued						£	s	d		
English Electric	£1	30/9		10	10	6	10	0	40/9	30/3
English Electric 3¾% Pref. ...	£1	10/6		3¾	3¾	7	2	9	11/9	10/6
Ericsson	5/-	28/6	+2/6	13†	13†	—			32/-	22/3
Ever Ready	5/-	37/6	+1/9	20	22½	3	0	0	40/-	31/6
Falk Stadelmann	£1	23/-		10	7½	6	10	6	26/-	21/9
G.E.C.	£1	29/9		10	10	6	14	6	39/6	29/3
G.E.C. 6½% Pref.	£1	17/-		6½	6½	7	13	0	19/3	17/-
General Cables	5/-	5/3		15	Nil	—			6/3	5/9
G.H.P. Group	£1	22/-	−6d	6	7‡	6	7	3	24/6	17/-
Goblin (B.V.C.)	5/-	4/6		12½	10	11	2	0	8/6	4/3
Hackbridge Holdings	5/-	5/-		20	20	10	0	0*	6/9	5/-
Harland Engineering	5/-	13/3		16	16	6	0	9	19/-	13/3
Head Wrightson	5/-	25/-		14	16	3	4	0	30/-	22/-
Heatrae	2/-	14/-	+1/3	12½	25	3	11	6	19/-	12/6
Holophane	5/-	16/6		26	30	9	1	9	20/6	16/6
Hoover	5/-	42/6	+5/-	90	45*	5	6	0	55/6	37/6
Hunt, A. H.	4/-	19/6	+6d	20	20	4	2	0	25/9	18/-
Intl. Combustion	5/-	28/-	+2/-	30	30	5	7	3	33/9	24/-
Intl. Computers & T.	£1	92/6	+3/9	10	11¼	2	8	9	107/-	59/-
Johnson & Phillips	£1	21/9		Nil	5	4	12	0	24/-	17/6
Kenwood Mfg.	1/-	4/3	+3d	—	—	—			6/-	4/-
Laurence Scott ... —	5/-	14/3		15	15	5	5	3	18/9	14/3
Lister, R. A.	£1	50/-	+4/6	14	14	5	12	0	56/9	45/6
Lucas, J.	£1	55/-	+1/-	12½	13¾	5	0	0	71/6	53/6
Marryat & Scott	2/-	16/9		27½	32½	3	17	6	18/6	13/9
Mather & Platt	£1	38/9	−3d	11	11	5	13	6	51/6	38/9
Metal Industries	£1	56/3	+6/3	15	15	5	6	9	66/6	50/-
Midland Elec. Mfg.	£1	62/6		12	12	3	16	9	67/6	58/6
Murex	£1	42/6	+1/3	20	13*	6	2	3	51/6	39/3
Newman Ind.	2/-	7/3	+6d	12½	15	4	2	9	7/6	5/-
Oldham & Son	1/-	2/9		17½	17½*	6	7	3	3/-	2/3
Parsons, C. A.	£1	54/6	+9d	9⅜	12½	4	11	9	72/6	46/9
Philips' Lamps	Fl.10	205/-		16	16*	1	11	0	£13¼	£10¼
Plessey	10/-	51/3	+9d	17	15*‡	3	18	0	60/-	46/6
Pullin Group	2/-	12/-	−3d	25	25	4	3	3	15/-	11/3
Pyrotenax	5/-	55/-		40	45	4	1	9	65/-	46/6
Radiation	£1	26/-	−1/-	12	10	7	13	9	37/6	26/-
Reliance-Clifton	5/-	28/9	+3/9	15	20	3	9	6	32/6	22/6
Reyrolle	£1	42/9	+9d	17½	9⅜*	4	11	3	51/6	36/6
Richardsons Westgarth	10/-	4/9	−3d	8½	Nil	—			8/3	4/9
Sangamo Weston	10/-	20/-		12½	13½	5	0	0*	25/9	19/9
Scott, James	5/-	30/6	+6d	25	27½	4	10	3	32/-	25/6
Simon Engineering	5/-	36/3	+2/3	—	27½	3	15	9	43/9	28/-
Smith (England), S.	4/-	15/3	+3d	17½	20	5	5	0	23/9	14/6
Southern Areas	£1	17/3	−1/3	5	6	6	19	0	23/-	14/6
Strand Elec.	5/-	17/9		14·6	20‡	5	12	9	20/-	12/3
Sturtevant	5/-	11/-		15†	13†	9	14	0	18/6	11/-
Sun Elec.	5/-	15/6		15	18½	5	19	0	17/6	15/6
T.C.C.	10/-	42/6		35	22½*	5	6	0	43/9	40/-
Telephone Rentals	5/-	24/-	+6d	15	15‡*	3	2	6	29/6	18/6
Thompson (John)	5/-	14/3		20	5	—			16/9	14/-
Thorn Elec.	5/-	48/9	+1/3	25	25	2	11	3	63/-	44/6
Thornycroft	4/-	6/-x.a.		6	6	—			7/-	6/-
Tube Investments...	£1	64/6	−2/3	—	14	4	6	9	85/-	64/-
Ultra Electric	5/-	25/-		20	25	—			31/3	12/6
Walsall Conduits	4/-	11/-	+3d	15	15	5	9	0	15/-	10/9
Ward & Goldstone	5/-	29/-	+1/3	35	17½*	3	0	3	36/6	25/6
Watford	2/-	7/3		25	20*	5	10	3	10/9	7/3
Westinghouse	£1	33/9	+6d	11	11	6	10	3	45/-	33/3
West, Allen	5/-	11/3	+6d	12½	13½	6	0	0	14/6	10/3
Wilkins & Mitchell	5/-	8/9		21	12	6	17	3	15/3	8/9
Wolf Electric	5/-	13/6		12½	13¾	5	1	9	17/6	13/6

Thorn Electrical Report

The increase in profits shown in the preliminary statement by Thorn Electrical Industries on the results for 1960–61 was regarded as a notable achievement in the circumstances prevailing during the period, and Mr. Jules Thorn's review confirms that the credit for it goes largely to the group's lighting products: every section of this business is said to have improved considerably. For radio and television, conditions were even worse than expected, but the domestic appliance side made substantial headway against difficulties, and there was good progress too in the fields of components and electronics. His statement encouraged the confident view of prospects which, coupled with the fourfold earnings cover for the dividend, accounts for a yield of little more than 2½ per cent on the 5s shares at 48s 9d.

Telephone Merger

Early market reactions to news of the proposed merger between Plessey, Automatic Telephone & Electric and Ericsson Telephones (three members of the consortium which contended with Pye last year for the control of Telephone Manufacturing) produced fairly sharp adjustments in the share prices concerned. The 10s shares of Plessey, which are to be offered in part exchange for shares in the other two companies, had risen to 55s 6d before the announcement and were initially marked back to 51s 3d. Shareholders are to receive a one-for-three scrip issue as a preliminary to the merger, and may expect dividends totalling 15 per cent on the increased capital for 1961–62. This would represent an increase of 2¼ per cent and bring the yield on the shares to more than 3¾ per cent.

A.T.E. and Ericssons

Initial rises in Automatic Telephone to 16s 6d, and in Ericsson shares to 28s 6d, reflected favourable consideration of the merger terms. They brought prices near to the levels appropriate to the proposed exchange of every 20 Ericsson shares for 15 new Plessey shares plus £1 cash, and for every 20 A.T.E. four Plessey shares, 10s cash and £10 convertible debenture stock (the latter being introduced with the object of maintaining shareholders' income until the full benefits of the merger materialise). From the combined earnings of the three companies in their last financial years it is calculated that the forecast dividend of 15 per cent on Plessey's enlarged capital would have a little less than two-fold cover. The boards of all three firms strongly recommended shareholders to support the proposals.

REPORTS and DIVIDENDS

Thorn Electrical Industries, Ltd.—Mr. Jules Thorn, chairman and managing director, concludes his speech to shareholders by saying, "I believe that our group is as well placed as any in the electrical industry to face the future with confidence and that we shall continue to give a good account of ourselves."

The increase of £200,000 in group trading profits he considers "a remarkably good achievement under the conditions which prevailed in the durable consumer goods industries during the year under review."

Atlas Lighting, Ltd., continues to make good progress, and turnover and profits have substantially exceeded any previous year. In every section of the lighting business, he reports considerable improvement. The order book is showing substantial increases over last year and Mr. Thorn views the future in this field with considerable confidence.

Ekco-Ensign Electric, Ltd., has again had a successful year and has contributed notably to the company's success in the lighting business.

In the radio and television field, trading conditions were even worse than had been anticipated and the whole industry suffered a severe setback. Had it not been for this, profits this year would have been substantially higher. However, by the reorganisation of production capacity and by energetic measures in the commercial field, the company was able to increase its proportion of the total industry business, albeit at a lower level. New designs and technical advances in the current product range give the board confidence that progress will continue despite problems created by Government restrictions and "economic regulators."

In anticipation of the extension of the television service into the ultra high frequency wavebands with higher definition monochrome pictures all the current models have been designed to enable easy conversion when such transmissions come into effect, so that nobody need be deterred from buying through uncertainties about the future.

As to colour, Mr. Thorn says it is certainly possible to give colour demonstrations under carefully controlled closed circuit conditions, but he believes it is wrong to mislead the public into thinking that they can have a satisfactory broadcast service. The group have developed a system which is believed to have many advantages over the U.S. system but the directors do not believe it to be at the stage when they can put colour on the market.

In the domestic appliances division, Tricity Cookers, Ltd., have made further solid progress: sales have continued to expand at a very satisfactory rate and under difficult market conditions profits have been increased substantially. The Tricity order book is healthy and Mr. Thorn is confident of a continuing substantial share of this competitive market.

The Special Products Division (incorporating components and connectors) had its best-ever year, and substantial achievements in electronics for instrumentation, industrial broadcasting and defence purposes have resulted from the activities of the company's laboratories.

On export markets, Mr. Thorn says that bearing in mind that British industry has lost some of its competitiveness in world markets, and the urgent need for vigorous action by exporters, the group is well equipped to meet this challenge. In the lighting field, export turnover for the year substantially exceeded all previous levels. The volume of fluorescent tube shipments was considerably in advance of all previous records. Exports of other types of lighting equipment continue to improve and the growing overseas demand for the company's fittings and street lighting lanterns is especially encouraging.

Shipments of radio and television sets again made an important contribution to total export turnover. Shipments of refrigerators and cookers were maintained and these products figure prominently in plans for a much increased overall export volume.

Overseas subsidiaries continue to make progress and these now constitute an important element in the group's international trading operations. In Australia, South Africa and Italy, manufacturing activities are expanding. Sales through the West German marketing company are increasing at a satisfactory rate.

Radio & Television Trust, Ltd.—Results for the first four months of the current year are well ahead of last year, both for output and profits, the chairman, Mr. Daniel Prenn, told shareholders at the annual general meeting last week. Nearly 25 per cent of the output was exported last year and this proportion would increase further. Contracts were shortly to be exchanged for the purchase of all the issued share capital of Thermionic Products (Electronics), Ltd., manufacturers of multi-channel recording equipment for air traffic control.

Mr. Prenn said that the name Radio & Television Trust was misleading and would be changed in the near future. The company made neither domestic radio and TV sets nor any components for the radio and TV industry.

Plessey Merger.—Under the terms of the proposed merger between the Plessey Co., Ltd., Automatic Telephone & Electric Co., Ltd., and Ericsson Telephones, Ltd., income of ordinary holders during the transitional period will be adjusted.

Plessey will pay a second interim (in place of a final) of 8½ per cent on the present capital for the year to 30th June, 1961; A.T.E. will pay an interim for the year to December, 1961, of 8 per cent; and Ericsson will pay an interim of 6½ per cent, free of tax, for the year 1961.

The Plessey board expects to be able to pay for the present year to 30th June, 1962, on the increased capital, an interim of 7½ per cent and a final of 7½ per cent.

As a result the gross income in that year of a holder of £100 ordinary capital of A.T.E. would be £16, and of a holder of £100 Ericsson ordinary capital, £22 10s.

The three boards believe the terms are fair to all classes of shareholders and strongly recommend acceptance. They believe the proposed merger is soundly based and calculated to safeguard the interests of shareholders and employees alike. The directors of A.T.E. and Ericsson will accept the offers in respect of all capital owned or controlled by them.

Cable & Wireless, Ltd., made a profit of £4,440,462 for the year to 31st March, an increase of £1 million over the previous year. In the light of this the directors recommend an increase in dividend from 4 per cent to 5½ per cent. Since the £30 million share capital is owned by the Government the Treasury benefits from a dividend payment up from £735,000 to just over £1 million.

The report, issued as a White Paper, says that results for the current year may not be quite so good but should still be satisfactory.

Prospects for the company are good, but not without uncertainties. The sphere and pattern of operation of the company in newly independent Commonwealth countries may change but it is hoped that, possibly through partnership arrangements, its knowledge and experience will continue to

(Continued on page 275)

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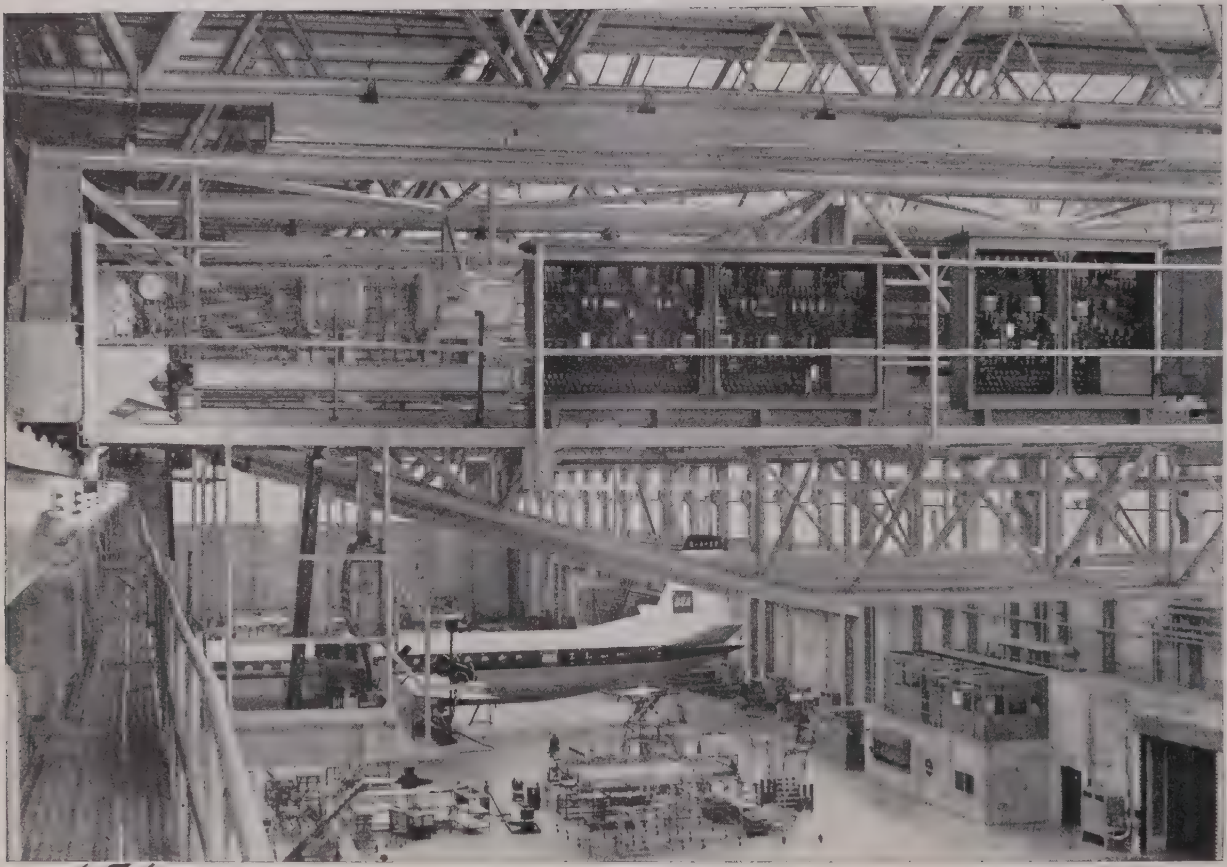

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FINANCIAL SECTION (*continued*)

serve the new countries. International telecommunications techniques are in an era of rapid and revolutionary change. At this moment, whilst actively engaged in the planning and installation of transoceanic telephone cables of advanced design and multi-channel radio systems, the company is paying close attention to the possibilities of communication via earth satellites and their effects on existing means of communication. So far as can be seen at the moment the systems will be complementary and interdependent.

It is thus clear that the company must be ready to adapt itself to rapidly changing operational and technical conditions. The cost of coaxial-telephone cable and multi-channel radio systems is very heavy. It is therefore gratifying, the directors state, that results continue good and that it has been possible further to strengthen reserves towards this expenditure.

Telegraph traffic carried over the company's system was 462 million words during the period, an increase of 22 million words, or 5 per cent, over the 1959-60 figure. The growth of radio-telephone traffic has continued and at 2,520,000 minutes shows a 5·4 per cent increase which would have been appreciably higher but for the continuing sharp decrease in local traffic between Hong Kong and China. The expanding telex service carried 417,500 minutes of traffic.

S. N. Bridges & Co., Ltd.—In his statement to shareholders of the parent company, John Brown & Co., Ltd., Lord Aberconway, chairman, reports that S. N. Bridges has maintained its turnover of portable electric tools, despite intense competition. Sales have increased in the industrial field and the new range of domestic appliances has been well received.

Christy Bros., Ltd., are increasing their dividend from 8 per cent to 10 per cent for the year ended 31st March last. Group profits were doubled from £49,694 to £100,820, and after tax of £50,418 (£22,944) the net profit of £50,402 compares with £26,750.

English Electric Co., Ltd.—Interim dividend 3 per cent (the same).

New Companies

Delapena Mechanical Developments, Ltd.—Registered 3rd July. Capital £100. Manufacturers of and dealers in electrical and mechanical domestic and industrial equipment, etc. J. M. D. Delapena, 48, Queens Gate Terrace, S.W.7, is the first director. Secretary: L. Litkin. Regd. office: 103, Great Portland Street, W.1.

Midland Electrical Construction (Wolverhampton), Ltd.—Registered 26th July. Capital £5,000. Electrical and constructional engineers, etc. Directors: P. E. Bate, Greenside, Eastgate, Brewood, Staffs., and D. Y. Hartshorne, Lyndal, Crestwood Park, Brewood, Staffs. (secretary). Regd. office: 67, Broad Street, Wolverhampton.

R.A. Electrical Contractors (Brighton), Ltd.—Registered 24th July. Capital £1,000. Directors: R. F. Amos and Nina E. Glass. Regd. office: 65, Blatchington Road, Hove, Sussex.

Robt. D. W. Bowtle, Ltd.—Registered 29th June. Capital £500. Manufacturers of, agents for and wholesalers and retailers of electrical and engineering equipment, scientific instruments and charts, etc. Directors: R. D. W. Bowtle and Constance M. Bowtle (secretary). Regd. office: 24, Gloucester Place, Brighton.

Central Electrical Services (St. Helens), Ltd.—Registered 26th July. Capital £2,000. Electricians, etc. Directors: J. R. Chibber, Newsham Lodge, Hillside Drive, Woolton, Liverpool (secretary), and A. Critchley, 175, Liverpool Road, Bickerstaffe.

Products of Langley, Ltd.—Registered 26th July. Capital £100. Electricians, etc. The subscribers are: R. C. Lisle, Croft Cottage, Chapman Lane, Flackwell Heath, High Wycombe, and R. Hill, Eaton Cottage, Sedlescombe, Battle. Solicitors: W. R. J. Hickman & Randall, 3, South Place, London, E.C.2.

John Bisco (Cheltenham), Ltd.—Registered 24th July. Capital £1,000. Dealers in electrical goods, etc. Directors: J. M. Bisco and Mrs. Kathleen J. Bisco. Regd. office: 349, High Street, Cheltenham.

Dyke & Ward Electronics, Ltd.—Registered 25th July. Capital £100. Electrical engineers, etc. Directors: A. Christie, D. G. Ward, C. E. Dyke and A. Hyman. Regd. office: Frith House, Church Street, Croydon.

Horton & Baird, Ltd.—Registered 25th July. Capital £500. Electrical engineers, etc. Directors: J. A. Horton and S. R. Baird. Regd. office: 8, Victoria Street, Maidstone.

Murco (Electrical), Ltd.—Registered 25th July. Capital £1,000. Electrical contractors. Directors: T. Murphy and W. Murphy. Regd. office: 39/40, County Chambers, Weston Road, Southend-on-Sea.

Telecolour, Ltd.—Registered 8th June. Capital £100. Electrical and television engineers, etc. Directors: D. H. Crisp and O. H. Tramontini. Secretary: T. A. Spittle. Regd. office: 26, Christchurch Road, Bournemouth.

Copeman Hart & Co., Ltd.—Registered 26th June. Capital £100. Designers, manufacturers of and dealers in electronic equipment, etc. Directors: E. C. Hart and A. J. S. Atkin (secretary). Regd. office: 40, Portland Place, W.1.

John H. Chigwall Electrical, Ltd.—Registered 27th June. Capital £1,000. Agents and brokers for manufacturers, merchants' buyers, etc. J. H. Chigwall is the first director. Secretary, Esme E. Chigwall. Regd. office: 52/4, Gray's Inn Road, W.C.1.

Barta Electrical, Ltd.—Registered 26th June. Capital £1,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Solicitors: Michael Kramer & Co., 137, Regent Street, W.1.

Fletcher & Bickerton, Ltd.—Registered 16th June. Capital £5,000. Electrical engineers, etc. Directors: S. W. Fletcher (secretary), 11, The Bridle Path, Ash Bank, Stoke-on-Trent, and H. Bickerton.

Packardex (London), Ltd.—Registered 16th June. Capital £100. Vendors and manufacturers of television and electrical appliances, floor polishers, refrigerators, etc. Directors: R. Sarkin and H. C. Rudolf. Secretary: M. Boltsa. Regd. office: Balfour House, Finsbury Pavement, E.C.2.

Paul Simmon, Ltd.—Registered 16th June. Capital £100. Electricians, electrical engineers, etc. Directors: P. Simmonds and Mrs. Edna M. Simmonds (secretary). Regd. office: 35, Northgate, Halifax.

Wright & Son (Electrical), Ltd.—Registered 5th July. Capital £100. Directors: E. E. Wright, 80, Kings Lane, Brentwood, Essex, and K. E. Wright, Longways, Second Avenue, Billericay, Essex.

Electronic Control Engineering (Sales), Ltd.—Registered 6th July. Capital £1,200. Directors: G. G. H. Baillie, C. L. Sell (secretary), J. E. Gayler and J. Scanlon. Regd. office: 206, London Road, Burgess Hill.

Gorewood Engineering & Trading Co., Ltd.—Registered 6th July. Capital £300. Importers, exporters, manufacturers and assemblers of, agents for and dealers in light and heavy electronic, electrical engineering equipment, plant, machinery, etc. Directors: W. R. Wood and Louisa B. Wood. Regd. office: Gore Cottage, Ashford Road, Bearsted, Maidstone.

Hughes & Orr (Electrical Contractors), Ltd.—Registered 4th July. Capital £100. Directors: R. F. Hughes and G. G. Orr (secretary). Regd. office; 319a, Trinity Road, S.W.18.

Farge Electronics, Ltd.—Registered 10th July. Capital £1,000. Directors: E. F. Jones, E. Gascoigne, S. Archer and W. M. Reynolds (secretary). Regd. office: 1, Plymouth Grove West, Manchester, 12.

F.G.D. (Holdings), Ltd.—Registered 7th July. Capital £10,000. To acquire electrical contracting and other types of businesses, etc. Directors: G. A. Keates and G. F. Thornton (secretary). Regd. office: 1, John Street, W.C.2.

T. G. Goodchild (Electrical), Ltd.—Registered 7th July. Capital £100. Directors: T. G. Goodchild (secretary) and W. H. Crossman. Regd. office: "Clovelly," Yew Road, Burwell, Cambs.

Electron Co. (Loboro.), Ltd.—Registered 7th July. Capital £7,500. Manufacturers of and dealers in electrical and electronic apparatus, etc. J. W. Wells is the first director. Regd. office: 36, Baxter Gate, Loughborough.

Roda Electrics, Ltd.—Registered 7th July. Capital £5,000. Electrical engineers, etc. Directors: F. C. Mottram and Winifred D. Mottram, both of 76, Park Hill Road, Wallington. Regd. office: 20, Telford Avenue, S.W.2.

Dudley of Oldham, Ltd.—Registered 10th July. Capital £100. General electrical installation contractors and engineers, etc. Directors: K. Dudley and Joyce Dudley (secretary). Regd. office: 330, Middleton Road, Oldham.

Balais Cleaners Co. (Provincial), Ltd.—Registered 28th June. Capital £500. Manufacturers of and dealers in electrical goods, etc. Directors: J. L. P. Charpin, J. E. Cullimore and A. J. Broad. Secretary: Felicitas Miller. Regd. office: 42, Devonshire Street, W.1.

Truro Valve Supply Co., Ltd.—Registered 28th June. Capital £100. Reconditioners, manufacturers of and dealers in television tubes, etc. Directors: R. D. Capham and Dorothy M. Capham (secretary). Regd. office: Carclew Street, Truro.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Sound Vision Service, Ltd., radio and television dealers.—Winding-up. Liquidator, Mr. G. A. Wale, F.A.C.C.A., Walter House, 418-422, Strand, London, W.C.2, appointed 19th July. Particulars of claims to liquidator by 15th September.

Carwood Electrical Supplies, Ltd., 126a, Larkhall Lane, Clapham, London, S.W.4.—Winding-up order made 31st July.

Martin Electric, Ltd.—Meetings of members and creditors 14th September at the offices of Latham & Co., Walter House, 418-422, Strand, London, W.C.2, to hear an account of the winding-up by the liquidator, Mr. A. W. Hunter.

Dell's Television Services, Ltd., 21, Aston Street, Birmingham, 4, retailers of electrical goods.—Liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, appointed 26th July.

Gosport Rentals, Ltd., 135, Brockhurst Road, Gosport, Hants., electrical sub-contractors.—First meetings of creditors and contributories today (Friday) at the Official Receiver's Office, 16, Westwood Road, Southampton.

Greenaway, Swanson & Co., Ltd., 15, Broad Street, Bath, domestic electrical suppliers.—First meetings of creditors and contributories 22nd August at the Official Receiver's Office, 26, Baldwin Street, Bristol, 1.

Scott Jones & Co., Ltd., 18, High Street, Lydney, Glos., electricians, radio and television engineers.—First meetings of creditors and contributories today (Friday) at the Official Receiver's Office, 26, Baldwin Street, Bristol, 1.

Singleton, Nelson & Co., Ltd., Brickyard, Edwalton Hill, West Bridgford, Nottingham, radio and electrical engineers.—First meetings of creditors and contributories today (Friday) at the Official Receiver's Office, 27, Regent Street, Park Row, Nottingham.

Telex, Ltd., 76, Shepherds Bush Road, London, W.6, dealers in radio, television and electrical goods.—First meetings of creditors and contributories today (Friday) at Room 401, 4th Floor, Inveresk House, 346, Strand, London, W.C.2.

Peto Scott Electrical Instruments, Ltd., Addlestone Road, Weybridge, Surrey.—Last day for receiving proofs for dividend 22nd August. Liquidator, Mr. K. R. Cook, 19, Eastcheap, London, E.C.3.

Meeting of Creditors

Audiovision (Electrical), Ltd.—Meeting of creditors, pursuant to Section 293 of the Companies Act, 1948, 22nd August at Friends House, 173, Euston Road, London, N.W.1.

Bankruptcies

W. I. Hunter, lately carrying on business as Hunter & Blacklock, The Pandom Garage, Broad Chase, Newcastle-upon-Tyne, and as Hunters Electrics, at 81-82, Redheugh Road, Gateshead, Co. Durham, etc., garage proprietor and electrical appliance dealer.—First meeting held 11th August. Public examination 10th October at the Court House, 56, Westgate Road, Newcastle-upon-Tyne, 1.

D. Boulton and **L. C. Turner,** lately carrying on business in partnership under the style of Derek Boulton at Old Town Avenue, Plymouth, Devon, wireless and electrical engineers.—Last day for receiving proofs for dividend 22nd August. Trustee, Mr. A. D. Gwyther, 1st Floor, Royal Building, St. Andrew's Cross, Plymouth, Official Receiver.

J. S. R. Morley, formerly carrying on business with another under the style of Morley & Bishop at The Street, Redgrave, near Diss, Norfolk, plumber and electrical engineer.—Trustee, Mr. C. A. Taylor, 3-5, Northgate Street, Ipswich, released 31st July.

P. D. Carless and **R. M. Jones,** radio, television and electrical retailers, lately carrying on business as Carless & Jones, at 22, Dogpole, Shrewsbury, Salop.—First meeting held 9th August. Public examination 19th October, at the Shire Hall, Shrewsbury.

R. S. Rance, lately trading as Fairway Radio & Television, at 142, Hamilton Road, West Norwood, London, S.E.27, radio, television and furniture retailer.—First meeting held 10th August, public examination 27th October, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

C. W. Boulton, now or formerly trading in partnership with Ivy Gladys Payne as P. & B. Electrical Appliance Co., at 19, High Street, Sheerness, Kent.—Receiving order made 12th July on a creditor's petition.

Ivy Gladys Payne, now or formerly trading in partnership with C. W. Boulton as P. & B. Electrical Appliance Co., at 19, High Street, Sheerness, Kent.—Receiving order made 12th July on a creditor's petition.

H. E. Turner, carrying on business at 26, Outram Street, Sutton-in-Ashfield, Nottingham, as a radio, television and electrical engineer and retailer.—Receiving order made 11th July on debtor's petition. Public examination 5th October at the Court House, St. Peter's Gate, Nottingham.

F. G. Vincent, radio, television and electrical dealer, carrying on business at Wellsley House, High Street, Westham, Pevensey, Sussex.—Trustee, Mr. R. B. M. Knight, 52, Old Steine, Brighton, 1, chartered accountant, appointed 26th July.

Electrical Homes (S-o-T), a firm, Whieldon Road, Stoke-on-Trent, domestic electrical appliance retailers and house furnishers, and lately carrying on business at 7, Glebe Street, Stoke-on-Trent.—First meeting held 10th August. Public examination 2nd November, at Town Hall, Hanley, Stoke-on-Trent.

S. Ross, formerly carrying on business as Jif Electrical Appliances and in partnership with another as Newington Electrics, 98, Matthias Road, London, N.16, as an electrical dealer.—Trustee, Mr. E. C. Sherwood, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver, released 2nd August.

STREET LIGHTING PLANS

Bournemouth Highways and Works Committee recommends that tenders be invited for the supply of equipment for the conversion of street lighting from gas to electricity. It is proposed to apply for sanction to borrow £100,000 to cover a three-year programme.

Bridgnorth Corporation is to invite tenders for the completion of Phase 3 of the street lighting programme to be carried out during 1961/62. The estimated cost is £3,750.

Kirkcaldy Corporation has approved proposals for the provision of side street lighting during the next financial year, at an estimated cost of £17,500.

Luton R.D.C. has approved a programme for street lighting during 1961-62, estimated to cost £3,775.

Slough Corporation has approved a proposal to include in the current programme for Stage 3 of the street lighting scheme the conversion of gas lamps on the trading estate, at an estimated cost of £15,015.

The 1961-62 street lighting programme at **Bromley** covers a further improvement in side street lighting and the conversion of group "B" colour corrected mercury lighting to group "A" sodium lighting on through traffic roads. The estimated cost of the proposals is £37,630.

Lamesley (Co. Durham) Parish Council is to carry out an electric street lighting scheme. About 400 gas lamps will be replaced by electric lamps at a cost of £16,000.

High Wycombe Corporation is recommended to seek sanction to borrow £11,000 for the improvement of the street lighting.

The fifth stage of **Newcastle-on-Tyne** City Council's scheme for converting street lighting from gas to electricity is nearing completion. The sixth stage, estimated to cost over £58,000, involves converting 1,575 gas lamps. Annual maintenance costs for the electric lamps will be £6,862, compared with £18,254 for the gas lamps.

The A.E.I. Lamp & Lighting Co., Ltd., has received a £12,000 contract from **Magor and St. Mellons** R.D.C. to supply and erect sodium street lighting along a 5½-mile stretch of the main A.48 Cardiff to Newport road between St. Mellons and Ebbw Bridge. The order is for 179 SL.3801 "Amberline" side-entry lanterns with 200 W sodium linear lamps and control gear and 35ft Stewarts & Lloyds steel columns.

A scheme for the conversion of street lighting in various streets at **Reading** from gas to electricity is estimated to cost £4,990.

Stockton-on-Tees Town Council is to borrow £25,100 for the relighting of certain classified roads in the town.

Sunderland Town Council is to carry out eight electric street lighting schemes costing altogether £21,000. The largest scheme, involving the town centre, will cost £5,000.

The total cost of changing street lighting at **Chatham** from gas to electricity will be £76,500. The scheme is to be completed in three years. The Council has ordered 950 lamp-posts and 1,076 lanterns.

Norwich City Council Executive Committee has approved a scheme for improved street lighting at an estimated cost of £20,420.

Keighley Corporation is to apply for permission to borrow £16,500 for street lighting conversion in the area between South Street and North Beck.

Halifax Corporation has approved proposed expenditure of £20,000 on the improvement of street lighting.

Tottenham Highways and Works Committee has approved details of a scheme submitted by the borough engineer for Stage IX of the street lighting improvements, for which £50,000 is provided in the 1961-62 budget.

Rowley Regis Borough Council is to spend £24,000 on street lighting in 1961-62.

Middlesbrough Watch and Licensing Committee has approved a scheme for converting street lighting in part of the southern area from gas to electricity during 1962-63. It is expected that within a few years all the town's lighting will be electric.

Scunthorpe Corporation is to seek sanction to borrow £11,422 for street lighting improvements in 1961-62.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 2nd September:—

KitchenAid. No. B796,628. Class 7. Dish washing machines.—Hobart Manufacturing Co., U.S.A. Address for service, Baron & Warren, 16, Kensington Square, London, W.8.

Sipowid. No. 809,141. Class 9. Resistors and condensers.—Siemens & Halske Akt.-Ges., Germany. Address for service, Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Cyclosyn. No. 811,138. Class 9. Electrical devices for converting mechanical into electrical signals for use in automatic control systems.—Lancashire Dynamo Electronic Products, Ltd., B.E.P. Works, Brereton Road, Rugeley, Staffs.

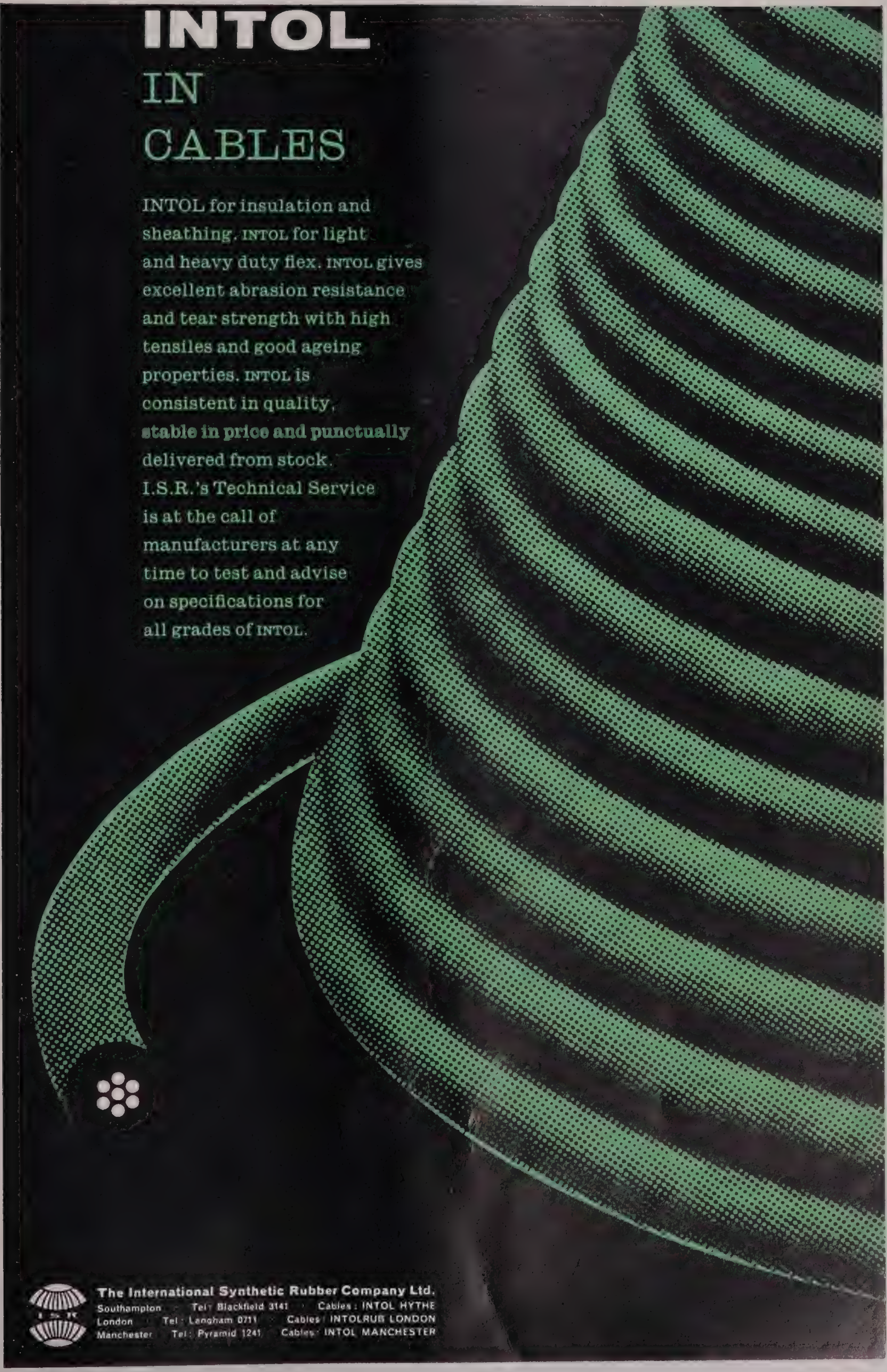
Ashdee. No. B814,440. Class 9. Electrical apparatus and instruments for use in the electrostatic particle spraying of paint and like materials.—Atlee Corporation, U.S.A. Address for service, Frederick J. Cleveland, 302-6, Bank Chambers, 329, High Holborn, London, W.C.1.

Eminet. No. B815,976. Class 9. Apparatus for the recording, reproduction and transmission or reception of sound; and television transmitting and receiving apparatus.—Electric & Musical Industries, Ltd., Blyth Road, Hayes, Middx.

Epitherm. No. 818,574. Class 9. Insulated conductors and cables. — A.E.G., Germany. Address for service, Matthews, Haddan & Co., 31-32, Bedford Street, Strand, London, W.C.2.

1001 (design). No. B811,315. Class 11. Electric lamps, lighting fittings, etc.—The 1001 Lamp Co., Ltd., 66 Tyrwhitt Road, London, S.E.4.

Gantrade. No. 819,567. Class 11. Electric lamps.—G. A. H. Andrews, 42a, St. Mary's Row, Moseley, Birmingham, 13.

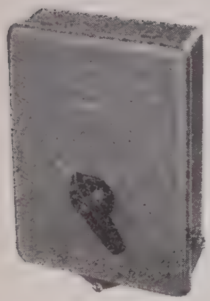


INTOL IN CABLES

INTOL for insulation and sheathing. INTOL for light and heavy duty flex. INTOL gives excellent abrasion resistance and tear strength with high tensiles and good ageing properties. INTOL is consistent in quality, stable in price and punctually delivered from stock. I.S.R.'s Technical Service is at the call of manufacturers at any time to test and advise on specifications for all grades of INTOL.

The International Synthetic Rubber Company Ltd.
Southampton · Tel: Blackfield 3141 · Cables: INTOL HYTHE
London · Tel: Langham 0711 · Cables: INTOLRUB LONDON
Manchester · Tel: Pyramid 1241 · Cables: INTOL MANCHESTER

'HIDUTAC' switchfuses pack more space into a smaller size

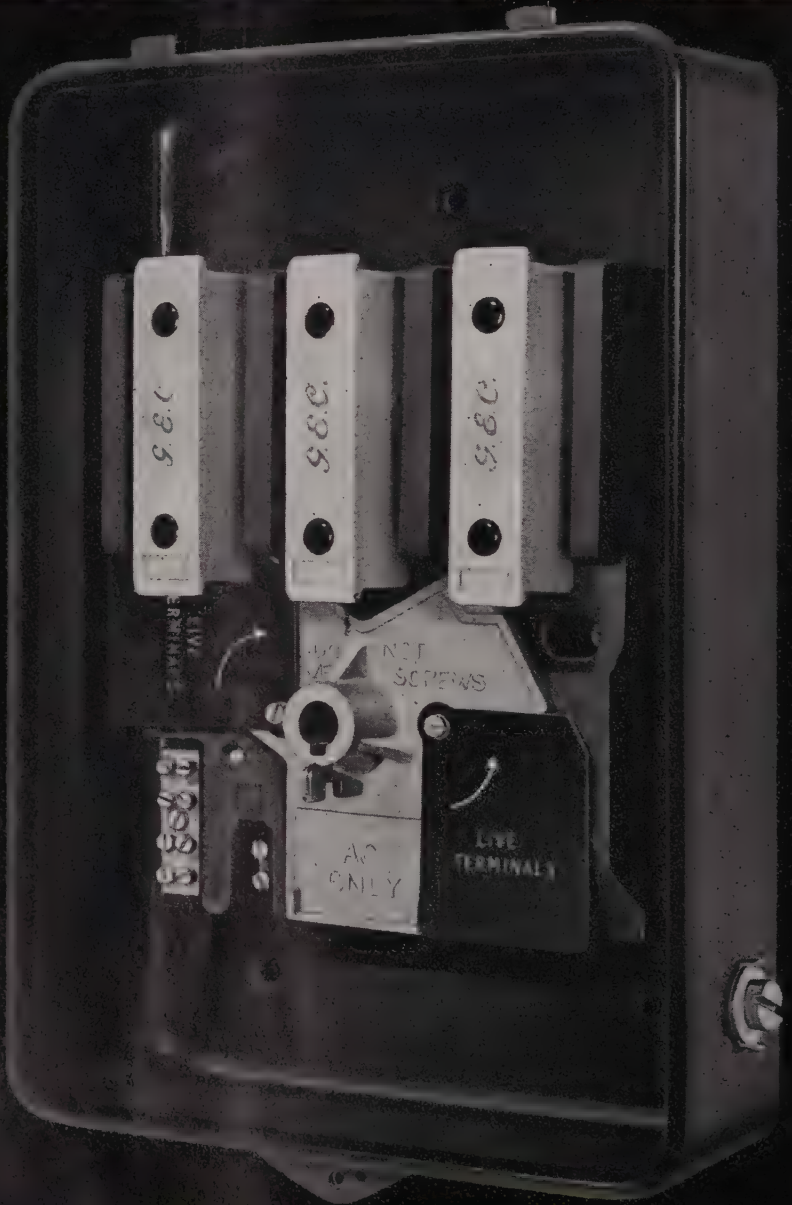


Radial positioning of the contacts of 'Hidutac' switchfuses allows a *unique compactness.* This is just one of many 'Hidutac' exclusive features resulting from G.E.C. Installation Equipment Group's *new approach,* based on many years' experience of making switchgear superbly well. The 60 amp. TPN 'Hidutac' measures only $13\frac{3}{16} \times 8\frac{1}{2} \times 4\frac{1}{2}$ in. yet there is still generous wiring space and easy access to the terminals at the front.

Consider these other impressive advantages : *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *High breaking capacity*—8 times the rated full load current—through cam-operated, double-break, silver contacts. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33,000 amp.); rewirable fuses, 15 and 30 amp. ratings, S2A of BS3036 (2,000 amp.); rewirable fuses, 60 amp. rating, S4A of BS3036 (4,000 amp.). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

IMMEDIATE DELIVERY *of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.*



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INSTALLATION EQUIPMENT GROUP

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

25964. Babcock & Wilcox, Ltd.—Electric heaters. 25th November, 1957. (874757.)

34173. Lincoln Electric Co., Ltd.—Electric arc welding apparatus. 24th January, 1958. (875660.)

37574. Lewis, T. X.—Apparatus for conversion of electric currents. 7th November, 1957. (875638.)

38391. Electric & Musical Industries, Ltd. —Velocity modulation tubes. 16th December, 1957. (875814.)

38900. Sangamo Weston, Ltd.—Electrically wound spring or weight-timing mechanisms. 22nd October, 1957. (875443.)

1957

1134. English Electric Co., Ltd.—Hydraulically actuated electrical switchgear. 7th January, 1958. (875014.)

1163. Associated Electrical Industries, Ltd.—Electro-hydraulic control systems. 22nd January, 1958. (875815.)

1325. Plessey Co., Ltd.—Radio apparatus adapted to obtain information from bodies in motion. 14th January, 1958. (875918.)

1844. Associated Electrical Industries, Ltd.—Coverings for electric cables. 17th January, 1958. (875772.)

3206. Contactor Switchgear, Ltd.—Control systems for electric motors. 17th January, 1958. (875958.)

3962. British Insulated Callender's Cables, Ltd.—Forming insulating bodies on cylindrical members, especially in armouring seals for electric cables. 2nd May, 1958. (875919.)

6231. Associated Electrical Industries, Ltd.—Electric traction equipments. 4th February, 1958. (875959.)

6307. Bazin, R. E.—Dielectric heating apparatus. 11th February, 1958. (874958.)

8446. National Research Development Corporation.—Apparatus for measuring voltage. 11th March, 1958. (875143.)

9222. Ferranti, Ltd.—Laminated magnetic cores for static electrical apparatus. 20th March, 1958. (875423.)

11434. Ever Ready Co. (Great Britain), Ltd.—Dry cells and batteries. 31st March, 1958. (875629.)

14396. British Oxygen Co., Ltd.—Electrodes and methods of electric arc cutting. 1st May, 1958. (875816.)

26236. Westinghouse Brake & Signal Co., Ltd., Eastop, R. H., and Walker, A. H. B.—Rectifier circuits. 20th August, 1958. (875564.)

27801. Laboratory for Electronics, Inc.—Spectrum tracking apparatus. 3rd September, 1957. (875368.) 27803/4. Apparatus for a doppler radar system. 3rd September, 1957. (875369/70.)

27942. Associated Electrical Industries, Ltd.—Photo-sensitive circuits employing transistors. 9th September, 1958. (874915.)

30553. Burgess Products Co., Ltd.—Hermetically sealed electrical switches. 1st September, 1958. (875580.)

30835. English Electric Co., Ltd.—Electric motor control systems. 30th December, 1958. (875188.)

32032. Pye, Ltd.—Electronic amplifiers. 13th October, 1958. (875631.)

33575. Associated Electrical Industries, Ltd.—Analogue-to-digital convertors. 28th January, 1959. (875066.)

34236. Radio Corporation of America.—Memory systems. 1st November, 1957. (874944.)

36296. Igranic Electric Co., Ltd.—Electrical switches. 21st November, 1957. (875535.)

36519. Burndept, Ltd.—Portable radio receivers. 23rd February, 1959. (875921.)

36788. Verhulst, R.—Electric fuse switch. 26th November, 1957. (875258.)

37793. Linde's Eismaschinen A.G., Ges. für.—Electric current source for arc welding. 4th December, 1957. (875922.)

38436. Texas Instruments, Inc.—Thermostats and thermostatic switches. 10th December, 1957. (875632.)

38983. Telefunken G.m.b.H.—Circuit arrangements for generating sawtooth currents. 16th December, 1957. (875831.)

39676. Garrett Corporation.—Compressors for refrigerating plants. 20th December, 1957. (875318.)

40252. Robert Maclaren & Co., Ltd., Maclaren, I. G., and Adam, I. R.—Automatic temperature control system. 29th December, 1958. (875077.)

1958

3092. Westinghouse Brake & Signal Co., Ltd., Simmons, A. W., and Darwall, M. T. D. —Electropneumatic braking apparatus. 30th January, 1959. (875588.)

20847. Petrolite Corporation.—Electric treater with hinged electrodes. 20th June, 1958. (875119.)

24423. Associated Electrical Industries, Ltd.—Devices for electric arc welding with flux-covered arc. 28th July, 1959. (875273.)

25343. Telegraph Condenser Co., Ltd., and Sporing, P. A.—Cylindrical electrical condensers. 23rd July, 1959. (875262.)

26347. Associated Electrical Industries, Ltd.—Magnetrons. 30th July, 1959. (875263.)

27016. United Kingdom Atomic Energy Authority.—Magnetic memory elements. 13th August, 1959. (875192.)

27588. United Kingdom Atomic Energy Authority.—Plasma discharge apparatus. 30th November, 1959. (874993.)

27987. General Electric Co., Ltd.—Control arrangement for slipring induction motors. 28th August, 1959. (875379.)

28296. Telemecanique Electrique.—Electric switch cases. 3rd September, 1958. (875171.)

29835 Merritt, L. F.—Spools for sound recording and sound reproducing machines. 15th September, 1959. (875260.)

30089. International Business Machine Corporation.—Magnetic core devices. 19th September, 1958. (875358.)

30756. Square D Co.—Electromagnetic assembly control devices. 26th September, 1958. (874969.)

33240. Associated Electrical Industries, Ltd.—Packing glands for armoured electric cable. 24th September, 1959. (874973.)

35449. Naimer, H. L.—Means for a correct relative positioning of axially aligned components of an electrical switch. 4th November, 1958. (875037.)

36348. Automatic Telephone & Electric Co., Ltd.—Automatic telephone systems. 30th October, 1959. (875294.)

37076. General Electric Co., Ltd.—Thermo-electric devices. 13th November, 1959. (874660.)

37284. General Electric Co.—Electromagnetic core members having slots for receiving windings. 19th November, 1958. (875360.)

38351. Associated Electrical Industries, Ltd.—Electronic switching circuits. 26th November, 1959. (875381.)

38959. Brown, Boveri & Cie. A.G.—Method and device for the direct electrical resistance heating of metallic rod-shaped bodies. 3rd December, 1958. (874685.)

39010. Wahlstrom, G. A.—Push-button electric switch. 3rd December, 1958. (875203.)

39183. Associated Electrical Industries, Ltd.—Electron beam furnace. 23rd November, 1959. (875399.)

39310. Standard Telephones & Cables, Ltd.—Electronic programme control equipment. 5th December, 1958. (874807.)

39882. Modern Telephones (Great Britain), Ltd., Ivens, E., and Simpson, A. I. F.—Loudspeaking telephones. 7th December, 1959. (874790.)

40778. Automotive Products Co., Ltd.—Self-opening electric switches. 27th November, 1959. (874792.)

41490. Marconi's Wireless Telegraph Co., Ltd.—Transistor oscillators. 8th September, 1959. (874995.)

41905. International Business Machines Corporation.—System for handling tape in a magnetic recording and reproducing system. 29th December, 1958. (875123.)

1959

693. Marconi's Wireless Telegraph Co., Ltd.—Radio frequency amplifier arrangements. 8th September, 1959. (875718.)

8981. Light & Power Accessories Co., Ltd., and Lott, F. J.—Fused electric plugs. 27th January, 1960. (875864.)

12601. Igranic Electric Co., Ltd.—Electromagnetic devices of the fluid damped type. 14th April, 1959. (875847.)

13913. Robertshaw-Fulton Controls Co.—Magnetically operated electric switches. 23rd April, 1959. (873392.)

18929. Chloride Batteries, Ltd.—Containers for electric accumulator cells. 1st June, 1960. (875851.)

20476. Borg-Warner Corporation.—Polyphase static invertor. 15th June, 1959. (875940.)

20945. United States Atomic Energy Commission.—Thermonuclear reactor. 18th June, 1959. (875941.)

37800. Allen, C. L.—Television monitoring device. 6th November, 1959. (874988.)

42422. Western Electric Co., Inc.—Magnetrons. 14th December, 1959. (874105.)

42741. Soc. d'Exploitation des Procédés Maréchal.—Junction or transfer clamp for electric cables. 16th December, 1959. (875693.)

43067. Marconi's Wireless Telegraph Co., Ltd.—Waveguide filters. 24th May, 1960. (873970.)

1960

4641. Griffith, J. W.—Device for mounting electronic components. 10th February, 1960. (874931.)

10099. Nippon Electric Co., Ltd.—Telephone circuit. 22nd March, 1960. (875341.)

14921. Tesla, Narodni Podnik.—Television modulators. 28th April, 1960. (874935.)

15112. Telefunken G.m.b.H.—Stereophonic radio and like transmission and receiving system. 29th April, 1960. (875094.)

16236. General Motors Corporation.—Electric fans. 9th May, 1960. (875059.)

19705. Communications Patents, Ltd.—Apparatus employing electronic valve devices. 3rd June, 1960. (874939.)

19724. Telephone Manufacturing Co., Ltd.—Electrical capacitors. 3rd June, 1960. (874940.)

19762. Mullard, Ltd.—Parametric amplifier. 3rd June, 1960. (875420.)

1961

13236. Laboratory for Electronics, Inc.—Doppler radar system. 3rd September, 1957. (875371.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Alfreton.—U.D.C. 26th August. Installation of 179 lighting units. Engineer and surveyor, Council Offices, Nottingham Road, Alfreton.

Antrim.—County Education Committee. 23rd August. Electrical installation in Derriaghy new primary school. J. Waring, consulting engineer, 31, High Street, Carrickfergus.

Argyll.—North of Scotland Hydro-Electric Board. Transformers for Nant power station. (See Classified Advertisement Section.)

Australia.—N.S.W. Electricity Commission. 18th September. 350 kVA testing transformer, voltage regulator and control equipment. (E.S.B. 25275/61.)*

Brighton.—Borough Council Water Department. 2nd October. Remote automatic control equipment for Patcham pumping station. (See Classified Advertisement Section.)

Cardiff.—City Council. 29th August. Electrically operated passenger lift at the aged persons' home, Llanishen. City architect's department, Municipal Offices, Greyfriars Road.

Carshalton.—U.D.C. 6th September. Supply and erection of 556 street lighting columns. (See Classified Advertisement Section.)

Ceylon.—Ministry of Agriculture, Land Irrigation and Power. 19th September. Armoured cable. (E.S.B. 25255/61.)*

Chichester.—City Council. 26th August. Replacement of pumping machinery and control gear at Mill Lane pumping station. City engineer and surveyor, Greyfriars, North Street.

East Barnet.—U.D.C. 26th August. Public lighting improvements scheme, 1961-62. Engineer and surveyor, Town Hall, Station Road.

Enniskillen.—31st August. Electrical installation in proposed extensions to St. Michael's Grammar School. C. P. McNally, consulting engineer, 143, Royal Avenue, Belfast.

Ethiopia.—Imperial Board of Telecommunications. 5th September. Telecommunication equipment. (E.S.B. 25229/61.)*

Formosa.—Central Trust of China. 9th September. Electrical testing equipment. (E.S.B. 25289/61/I.C.A.)*

Glasgow.—Corporation. 7th September. 5,000 bracket fittings for stairlighting. (See Classified Advertisement Section.)

India.—National Coal Development Corporation, Ltd., Ranchi. 5th September. Electric cables. (E.S.B. 25241/61.)*

Government Medical Stores, Trivandrum. 29th August. X-ray apparatus. (E.S.B. 25265/61.)*

Singareni Collieries Co., Ltd. 31st August. Coal drills. (E.S.B. 25297/61.)* 1st September. Coal drill transformer panels. (E.S.B. 25298/61.)* 2nd September. Twelve 300 kVA and twelve 200 kVA transformers. (E.S.B. 25299/61.)*

India Store Department. 29th September. Bus ducts for transformer leads. (E.S.B. 25532/61/D.L.F.)*

Iraq.—Iraqi Ports Administration, Basrah. 3rd September. Low voltage underground cable and accessories. (E.S.B. 24923/61.)*

Directorate General of Municipalities. 2nd September. Low voltage insulators. (E.S.B. 24970/61.)*

Ministry of Defence. 18th September. 1,000 160 W, 230/250 V fluorescent lamps. (E.S.B. 24977/61.)*

Kuwait.—Department of Electricity, Water and Gas. 3rd September. Conduit fittings. (E.S.B. 25213/61.)*

Morley.—Corporation Street Lighting Department. 16th September. Sodium street lighting installation. (See Classified Advertisement Section.)

Pakistan.—Post and Telegraphs, Directorate General, Karachi. 23rd August. Three 500 V "Megger" testers. (E.S.B. 25221/61.)*

Chief Controller of Purchase, P.W. Railway, Lahore. 28th August. 2,320 yd underground cable. (E.S.B. 24982/61.)*

Eastern Railway, Pahartali, Chittagong. 27th September. 350 kW diesel engine driven generating set. (E.S.B. 25537/61.)*

Portuguese East Africa.—Public Works Department, Lourenço Marques. 19th September. Power distribution network. (E.S.B. 24978/61.)*

Poynton. — Poynton-with-Worth Parish Council. 18th September. Installation of Class "A" lighting on trunk road at Poynton. (See Classified Advertisement Section.)

South Africa.—State Tender Board. 1st September. Electrical distribution board, three 35 h.p. motors and three starters. (E.S.B. 25523/61.)*

Staines.—U.D.C. 6th September. 190 Group "A" 250 W MBFU lighting units and a similar number of Group "B" 100/150 W tungsten street lamps, with re-siting of some existing lamps. Engineer and surveyor, Shortwood House, 240, London Road, Staines.

Stockton-on-Tees.—Corporation. 8th September. Re-lighting of trunk road A19. (See Classified Advertisement Section.)

Sudan.—Controller of Stores, Sudan Railways. 28th August. Two 10-ton overhead electric travelling cranes. (E.S.B. 24618/61.)*

Syria.—Port Directorate. 5th September. Refrigeration equipment. (E.S.B. 25268/61.)*

Thailand.—Telephone Organisation. 7th September. Telephone coin box apparatus. (E.S.B. 25505/61.)*

Uxbridge.—Borough Council. 11th September. Rewiring of existing lighting circuits and provision of ring-main circuits in houses at Hillingdon and Cowley. (See Classified Advertisement Section.)

Watford. — Corporation. 25th August. Electrical work in connection with Central Library extension. (See Classified Advertisement Section.)

Wigan.—Borough Council. 6th September. Complete wiring installation of dwellings at Beech Hill and Laithwaite housing estates. (See Classified Advertisement Section.)

ORDERS PLACED

Carlisle.—Corporation. Class "B" lighting on housing estate footpaths (£1,037) and Class "A" lighting in Dalston Road area (£2,504).—B. L. Oliver.

Eccles.—Corporation. Electrical installation work in 102 flats at Philip Street, etc. (£3,597) and 90 flats at Egerton Street (£4,073).—E. Soper & Co.

Glasgow.—Education Committee. Installation work at Secondary School, Easterhouse (£29,135).—James Scott (Electrical Engineers). Electrical installation at Special School, Drumchapel (£11,205).—B. French.

Scarborough.—Corporation. Re-wiring and additional electrical work at 168 houses on the Northstead estate (£6,726).—Goods of Scarborough.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bradford.—Nose, throat and eye unit at the Royal Infirmary (£507,580), for Leeds Regional Hospital Board; secretary, Park Parade, Harrogate.

Bristol.—Factory, Waterloo Street; A. T. Poeten & Son, Ltd., Tower Hill.

Office block, High Street and Wine Street; Wm. Cowlin & Sons, Ltd., Stratton Street.

Burnley.—Office extensions; Burnley Building Society, Grimshaw Street.

Cardiff.—Works, Wentloog Road; Williams Alexandra Foundry, Ltd., East Moors Road.

Home for the aged and infirm at Caerau (£68,000); city architect, 12, Park Place.

Carlisle.—Extensions to Technical College, for T.C.; Buckland & Haywood, architects, Norwich Union Chambers, Congreve Street, Birmingham.

Darlington.—Proposed Branksome Secondary School for the T.C.; borough architect.

Factory additions, Aycliffe trading estate; Fennell & Baddiley, architects, Bridge End Chambers, Chester-le-Street.

Durham.—Grammar/technical school at Annfield Plain for the C.C.; W. & T. R. Milburn, architects, 4, Grange Terrace, Sunderland.

Register offices at Jarrow for the C.C. (£10,000); M. S. Failes, Ltd., builders, 199, Coatsworth Road, Gateshead.

Additions to Dryburn Hospital for Newcastle Regional Hospital Board, Benfield Road, Newcastle-on-Tyne (£110,000); P. H. Knighton, Board's chief architect.

Houses (26) at Grape Lane for the City Council; Tarren & Caller, architects, 26, Front Street, Sedgefield.

Easington (Co. Durham).—Houses (19) at High Hesleden; R. Lumsden, R.D.C. surveyor.

Felling (Co. Durham).—Swimming baths on the Leam Lane estate (£240,000); Harbour & General Works, Ltd., contractors, Springwell Road, Washington, Co. Durham.

Gateshead.—Civic restaurant, Park Lane, for the T.C. (£42,000); John T. Bell & Son, builders, Market Street, Newcastle-on-Tyne.

Factory, Team Valley trading estate, for Thomas de la Rue, Ltd., London.

London.—Office block, Clifton Street and Christopher Street, E.C.; Ley, Colbeck & Partners, architects, Palmerston House, Bishopsgate, E.C.2.

Dwellings (32), Lofting Road, Islington; H. Richardson & Son, Ltd., Slade Green, Erith.

Factory, North Road, Islington; Selincourt & Sons, Ltd., 3, Vere Street, W.1.

Office block, North Circular Road and Abbeydale Road, Willesden; Tersons, Ltd., 4, Dollis Park, N.3.

Houses (70), mews flats over garages (42), and flats in eight-storey block (64), Vanbrugh Park, Blackheath, S.E.3; Chamberlin, Powell & Son, architects to B.C., 1, Lamont Road, Kings Road, London, S.W.10.

Conversion of large residential property into flats, Clapham; borough engineer and architect, Municipal Buildings, Wandsworth, S.W.18.

Slough.—General Hospital; J. Roger Preston & Partners, electrical and mechanical consultants, 15, North Audley Street, W.1.

Stirlingshire.—Reconstruction of Falkirk High School, Rennie Street (£237,528); county architect, Viewforth, Stirling.

Stonebroom.—Sewage disposal works (£184,000); R.D.C. surveyor, Chesterfield.

*** This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.**

complete battery schemes for SUBSTATIONS

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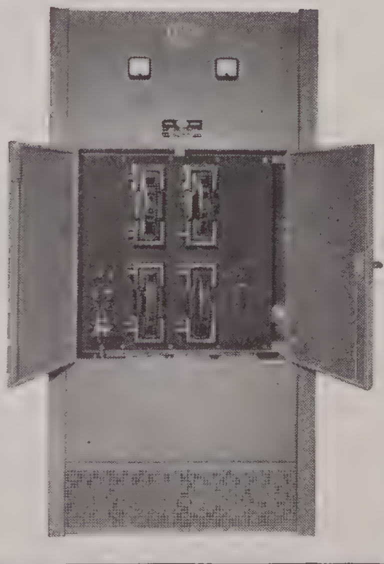
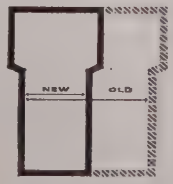
◄ Part of a 110-V battery of latest Tudor High Performance Cells in a Midlands Electricity Board substation at Fenton, Staffs.

► This combined automatic charger/fuseboard is part of the Tudor installation. Photos: Courtesy The Midlands Electricity Board.



The latest Tudor High Performance Cell



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PRODUCTION ARMATURE WINDING MACHINE

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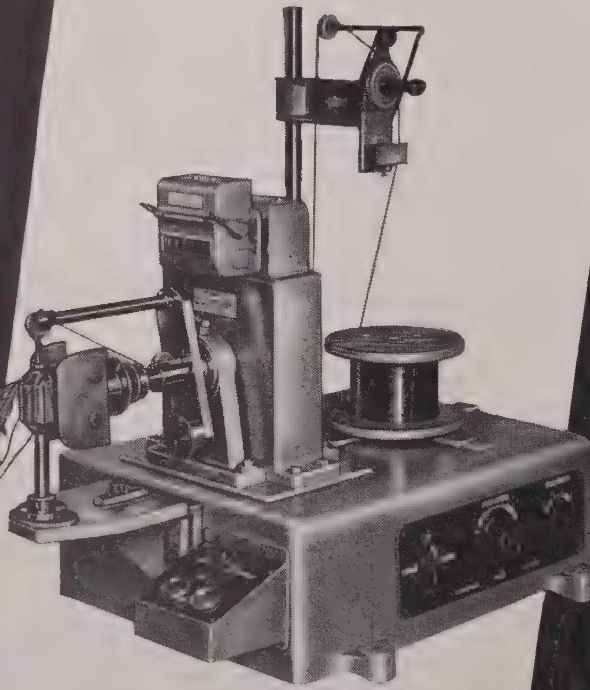

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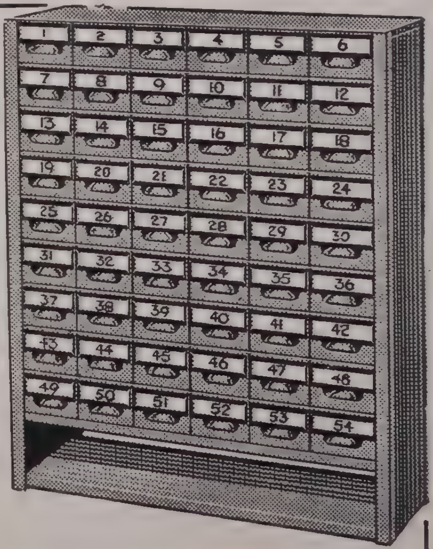

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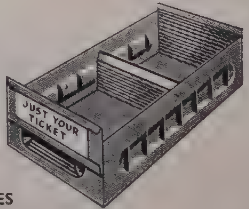

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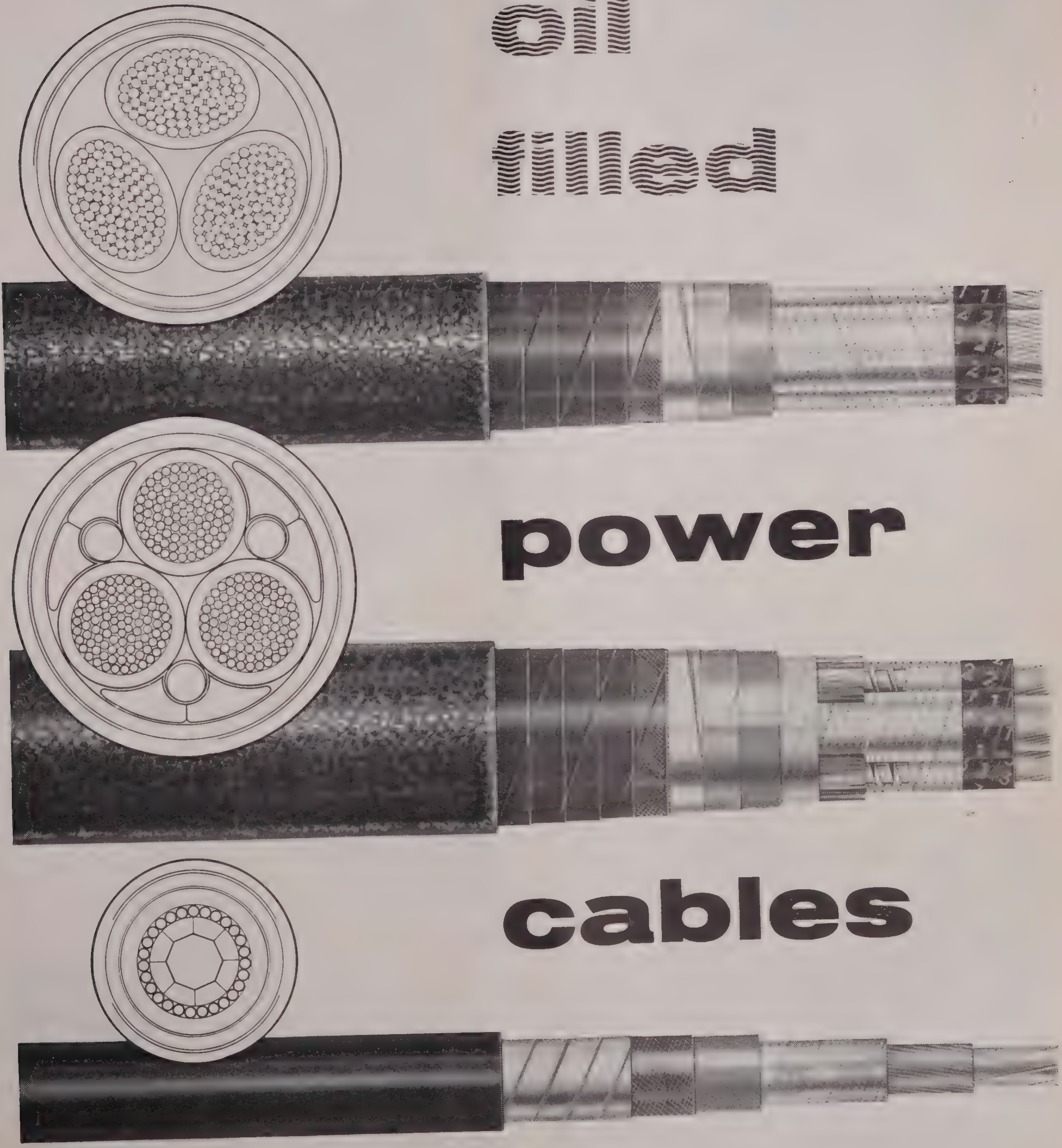

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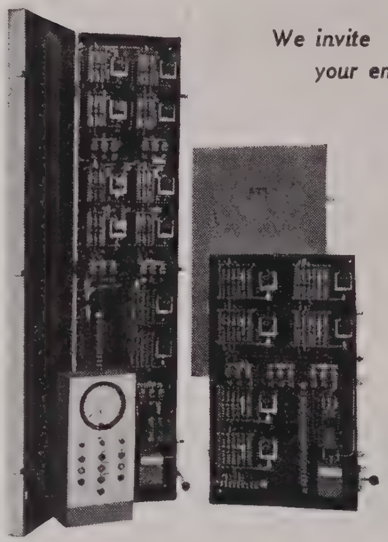

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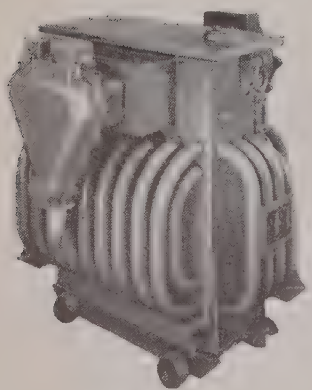

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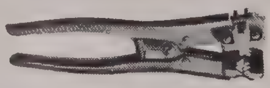

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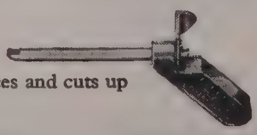

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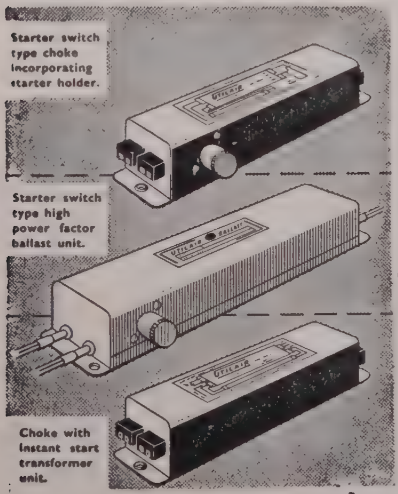
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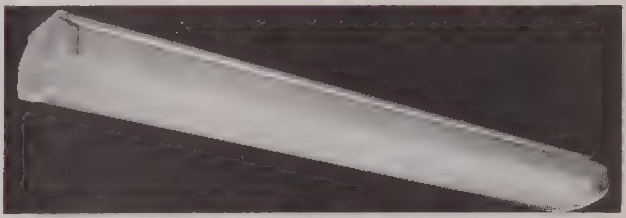

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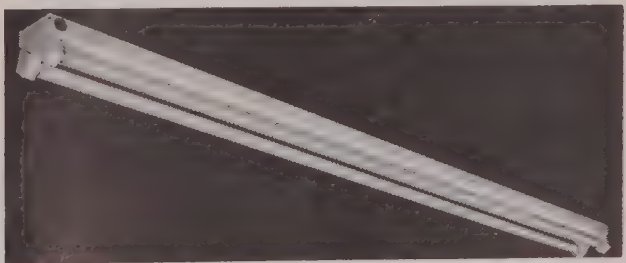

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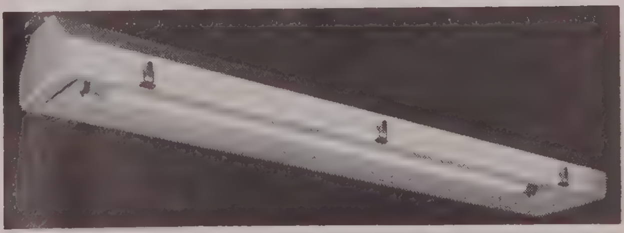

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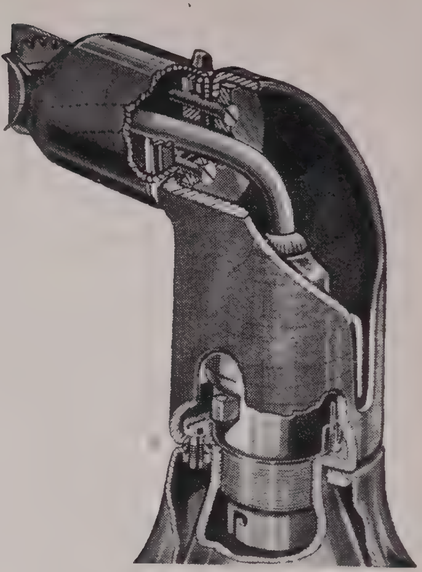

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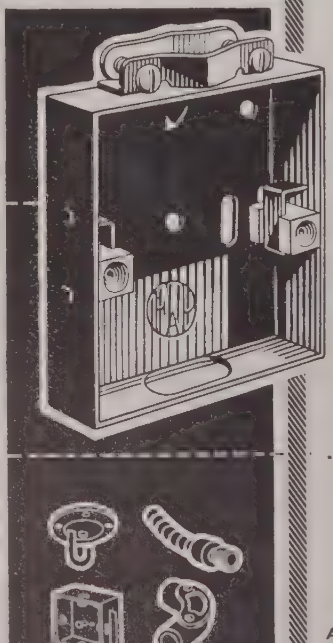

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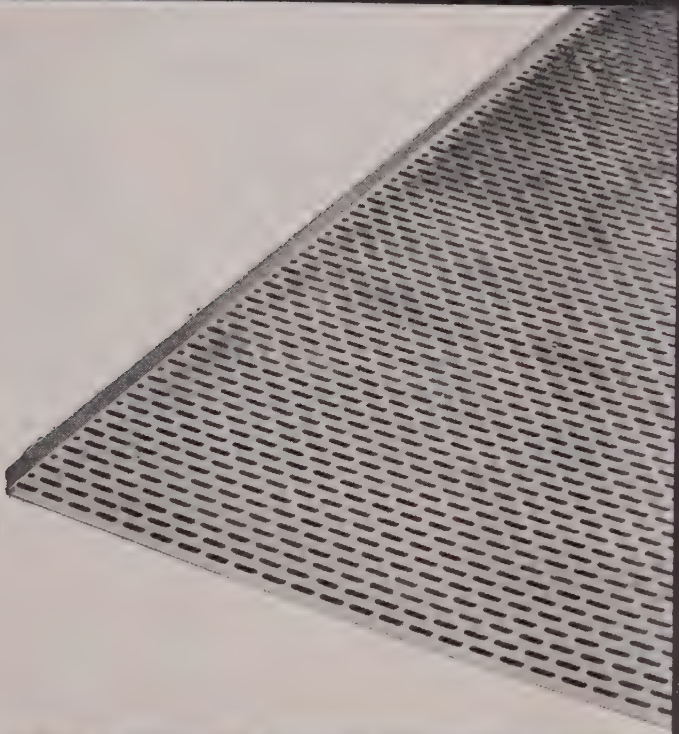

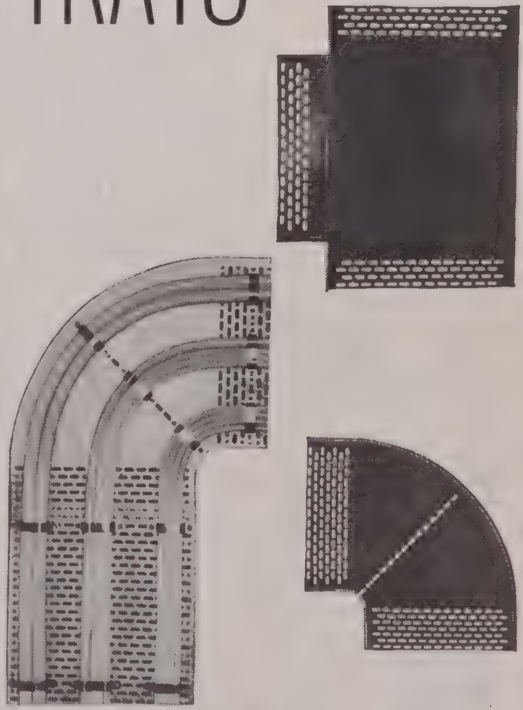

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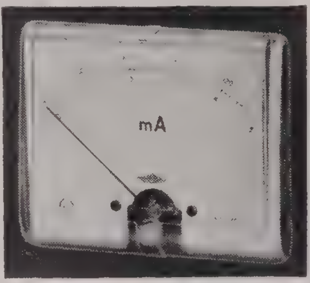

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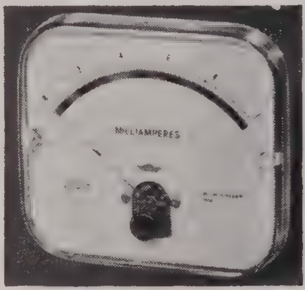

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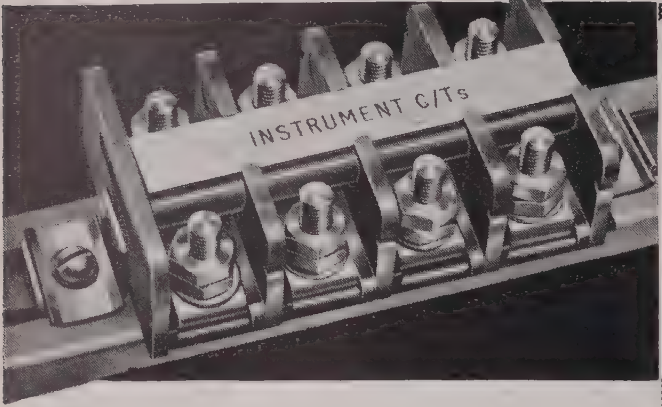

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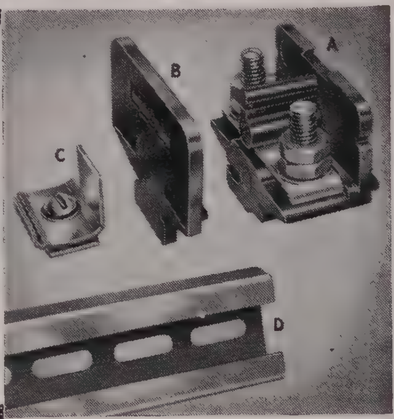

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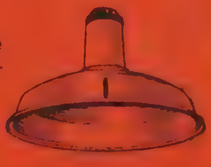

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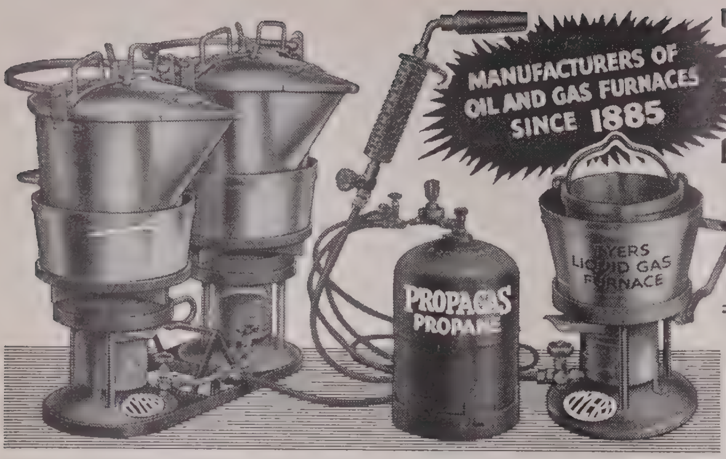

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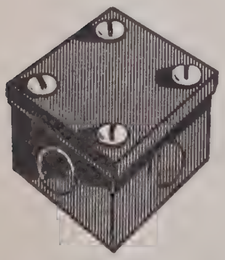

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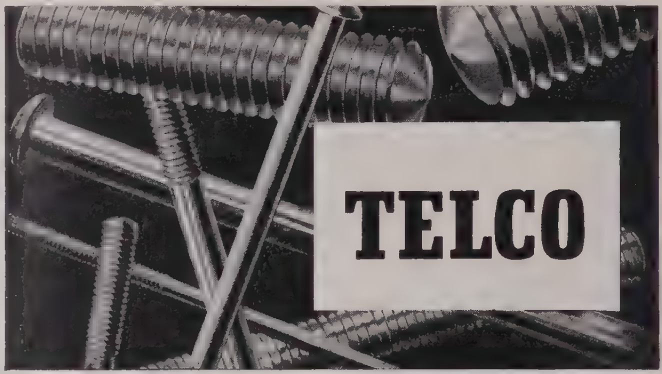

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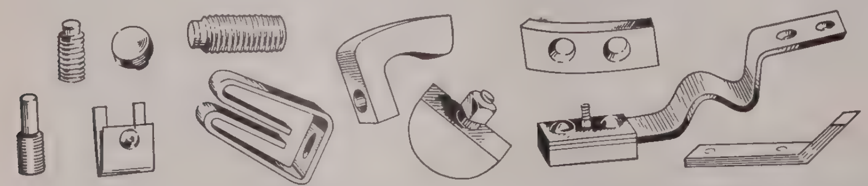

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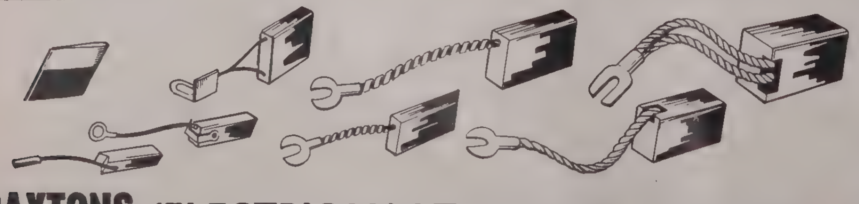

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mains

rectification

COSTS

The Mullard BYY15 Silicon Power Rectifier offers:

- * Direct rectification of the mains
- * High reliability factors
- * Space savings
- * PLUS lower costs

For the direct rectification of 250V mains, with full voltage tolerance, the Mullard BYY15, a 20A, 400V silicon power rectifier, offers high performance and reliability at a really economical price.

It can be used in series or parallel combinations for output currents of more than 20A and still show an appreciable saving over rectifiers with higher current ratings. From a 250V supply a single phase bridge of four BYY15's gives an output current of 40A and a three phase bridge of six BYY15's gives 60A.

For full data on the BYY15, please write to the address below quoting reference E358.

Mullard

semiconductors
for industry

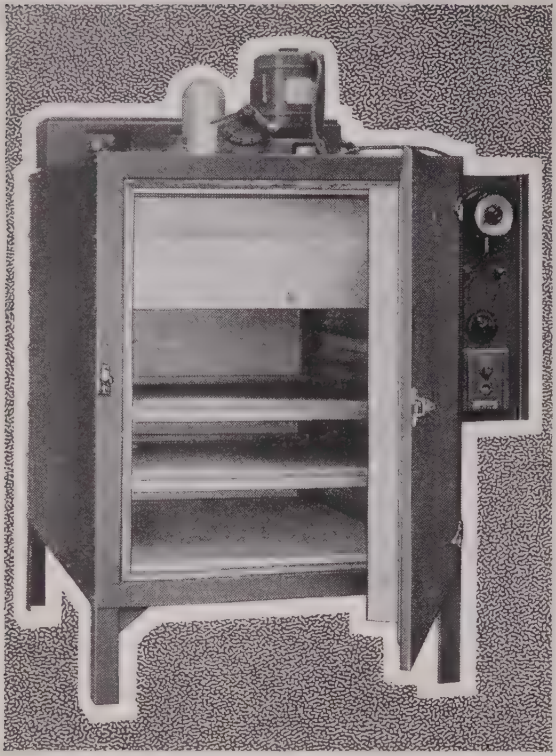
MULLARD LIMITED *Semiconductor Division*
Mullard House Torrington Place London WC1
Telephone Langham 6633

Mullard

MIS 35

NEW 'closed circuit' low temperature OVEN

(*Patent Pending*)



cuts DRYING TIME FROM HOURS TO MINUTES

The revolutionary new A.E.W. 'Closed Circuit' Drying Unit saves hours of drying time. It steps up production and saves you money by using low temperatures of 35°C to 40°C. The secret—there is no air exchange to the atmosphere, the same air is re-circulated and all moisture is absorbed by the drying unit. Pre-heating is unnecessary and drying starts the moment you press the switch.

A seven section coil was placed under a tap, soaked with water and stored in a damp cardboard box for 6 hours. It was then placed in the oven and dried for an hour.

Look at this **ACTUAL TEST!**

The astonishing result is shown below. (The figures represent insulation resistance in megohms.)

Winding	T 1	A 1	A 1	A 3	A 3	A 5	A 5	A 1	A 7	A 9	A 9	A 11
Before Drying	250		440		260	60		230		170		
After Drying	55,000		60,000		80,000	60,000		250,000		300,000		

Several hours at a much higher temperature would have been needed to achieve this result with a conventional oven.

Write for brochure giving fullest details.
Demonstrations arranged at our Works.

AEW

A.E.W. LTD DEPT. E.R.2 · IMPERIAL WORKS · EDGWARE · MIDDX · Tel: EDGware 5278

SHIMALERT VIBRATING TYPE SIGNAL HORN

REF. SAH 33B

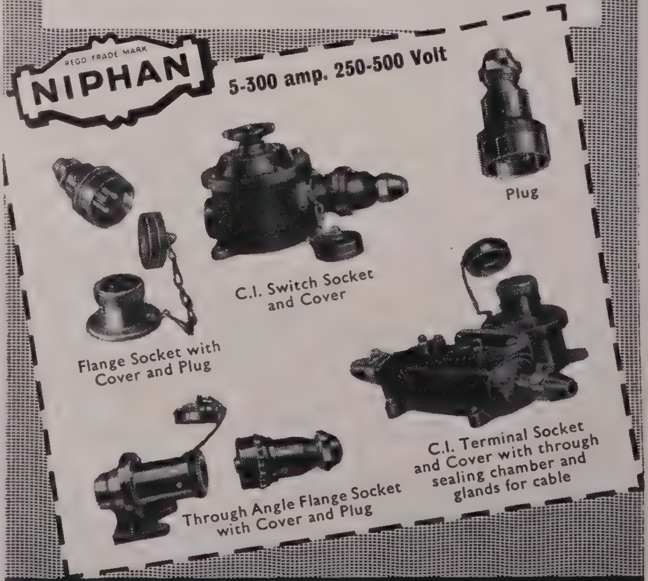
Reliable penetrating warning device. Range of 250 yards in still air. Die cast aluminium weatherproof case with conduit entry.
AC or DC 6 to 250 volts.

Also available in flameproof cast iron case with one or two cable entries.
REF. SAH 32A

SHIMWELL, ALEXANDER & CO. LTD.
20 BEVIS MARKS, LONDON, E.C.3
Telephone: AVEnue 6111-7. Telegrams: Shimalec, Fen, London

WEATHERPROOF METAL-CLAD SOCKETS, PLUGS, SWITCH SOCKETS etc.

for all electrical purposes


REGD TRADE MARK
NIPHAN
5-300 amp. 250-500 Volt
Plug
C.I. Switch Socket and Cover
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SIMMONDS & STOKES (NIPHAN) LTD
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Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

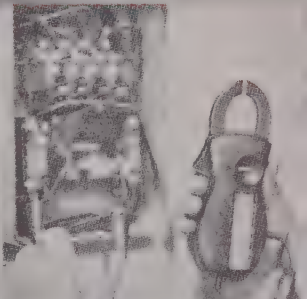
ONLY ONE SNAP-AROUND TESTS ALL THREE!

AMPROBE RS-3

THE AMPROBE RS-3 is the *only* pocket-sized, snap-around test nstrument that measures voltage, mperage *and* resistance. Designed or one-hand operation, the RS-3 acurately locates opens and shorts, ets overload relays, balances loads, etermines low- or high-voltage conitions…in fact, it handles up to 9% of *all* your test needs!

The rugged, lightweight AMPROBE s-3 meets every commercial voltage equirement on three voltage scales: -150/300/600 volts AC. It also has five current ranges from 0 to 300 amps, and a resistance scale with a mid-range reading of 25 ohms. The readings are taken from a *rotary* scale…it reveals only one range at a time to increase reading speed, minimize chance of error. The RS-3 comes complete with test leads, ohmmeter attachment, genuine cowhide leather carrying case, and a *one-year guarantee* against defects in parts or workmanship. See your distributor or write today for more information. **only £ 20·12·0**

AS AN AMMETER: snapped around conductors to balance circuits.



AS AN OHMMETER: check resistance of motor control solenoid coil.

AS A VOLTMETER (large photo): check voltage on slipring of motor.

PYRAMID INSTRUMENT CORPORATION, U. K. SALES DIV.: H. J. BALDWIN & CO. LTD., VICTORIA MILLS GAMBLE ST., NOTTINGHAM

Self-contained
variable-speed
THREE-PHASE A.C. MOTORS

IMPORTANT ADVANTAGES

Speed

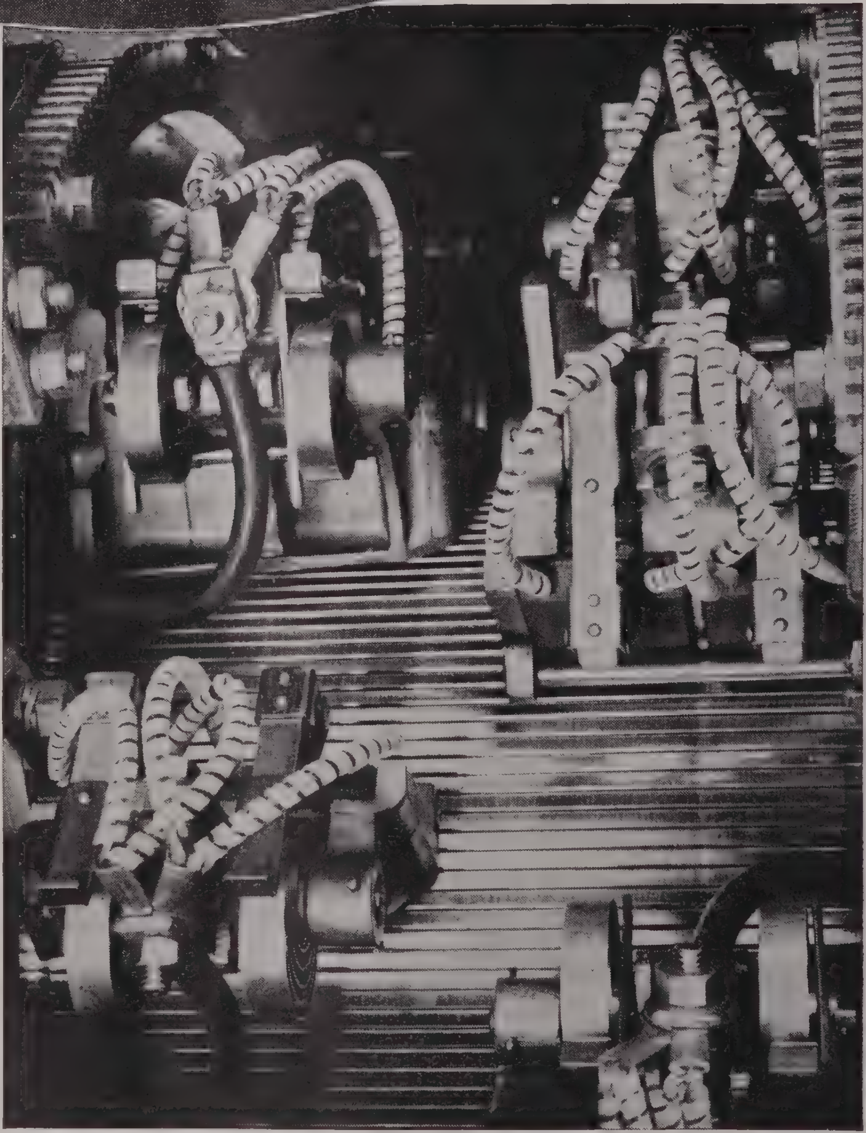
Stepless variation, with unlimited speed ratios. No external regulator. Wide speed range, with reverse operation when required. Speed variation may be by hand, remote or servo control.

High Performance

Good shunt characteristics at all speeds, whether motoring or generating. High efficiency and power factor throughout top half of speed range. High starting torque with low starting current.

Good Delivery

Motors between 20 and 100 h.p. are built from stock parts ensuring short delivery times.



Write for further information to:

(FOR MOTORS BELOW 20 H.P.)
Small Industrial Machines Sales,
Motor & Control Gear Division,
BLACKHEATH, STAFFS.

(FOR MOTORS OF 20 H.P. AND UPWARDS)
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Heavy Plant Division,
RUGBY.

AEI **Associated Electrical Industries Limited**

A 5571

Signs of the times...

Electrified by BICC CABLES

High-speed night traffic depends on reliable, well illuminated signs — signs that are vital to the safety and smooth running of Britain's motorways. Directional signs, keep-left bollards and street lighting points on the new Ross Spur motorway are supplied with electricity by BICC P.V.C. Insulated Single Wire Armoured Cables.

The installation was carried out — under extremely adverse weather conditions — by the Contracting Staff of the Midlands Electricity Board who affirm that the ease of handling the cables and the simplicity of jointing were important factors in the speedy completion of the job.

Fifty BICC Branch Offices provide a nation-wide service.

British Insulated Callender's Cables Limited, 21 Bloomsbury Street, London W.C.1

Gosheron
tapes

serving industry
—everywhere

superbond
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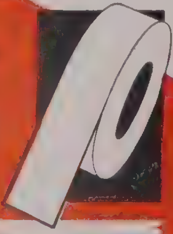
SELF-ADHESIVE
labels

SUPERBOND TICKOTABS — with double strength adhesive at no extra cost — specially developed for difficult labelling surfaces. Available in any shape, size and colour scheme, in the handy TICKOTAB Dispenser, supplied free with each reel.

Write for "Tape Times" now — the up-to-date journal for all tape users.



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Gosheron
& Co. Ltd

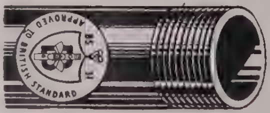
THE PACKAGING & INDUSTRIAL TAPE CENTRE
ALBERT EMBANKMENT LONDON S.E.1
RELiance 7600/9

Photo courtesy Elliott Brothers (London) Ltd

SUPER STEEL CONDUIT
to B.S. 31

In a variety of diameters

... from ⅝ inch to 2½ inches in light or heavy gauges. Furnace welded Burn Condu't is distributed from wholesalers throughout the country to give you rapid delivery.



GEORGE BURN LIMITED

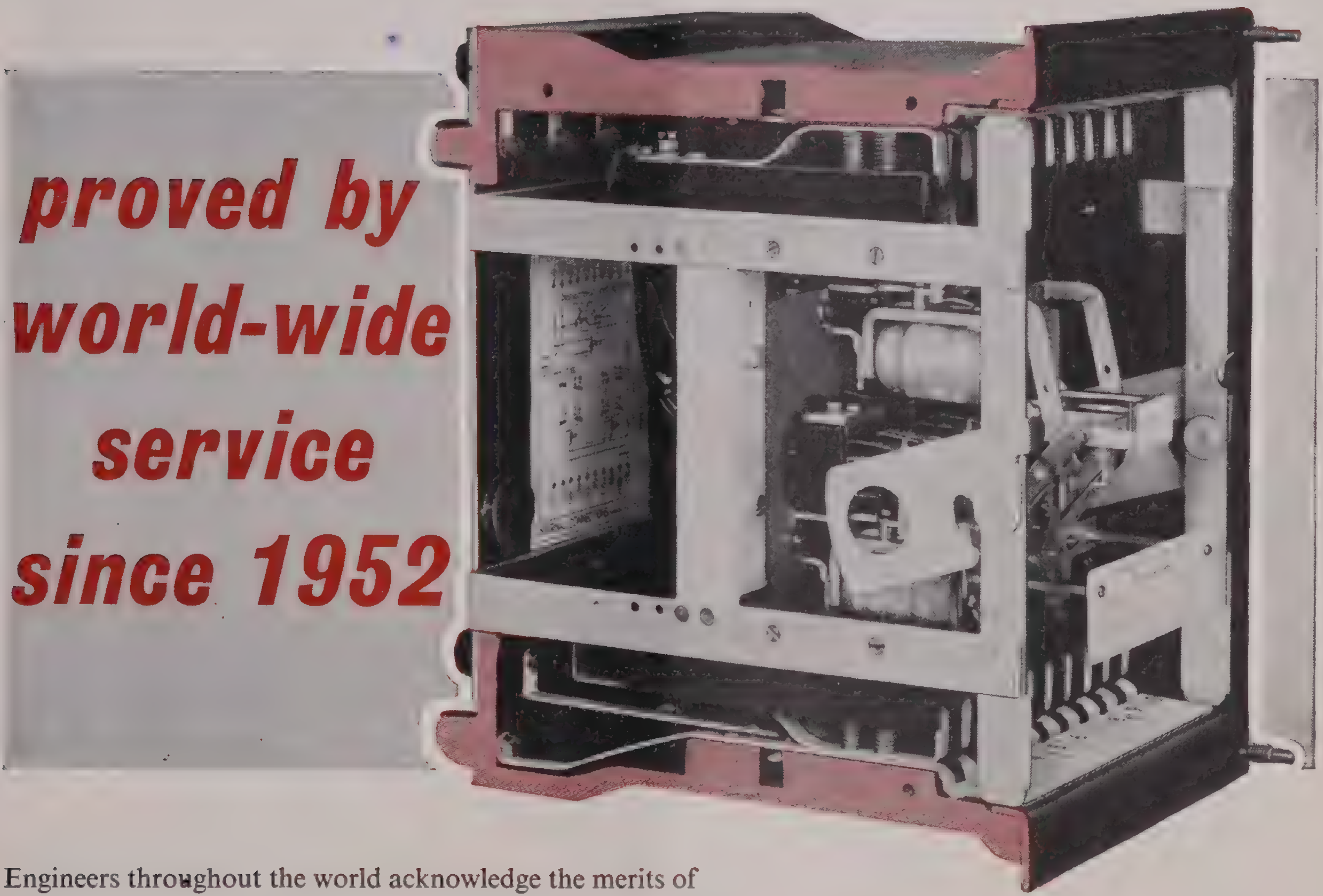
TUBES

GEORGE BURN LTD. City Tube & Conduit Mills,
Smethwick, Birmingham.
Telephone: Smethwick 1511 (5 lines)

GB59

'ENGLISH ELECTRIC'

draw-out relay cases



Engineers throughout the world acknowledge the merits of 'ENGLISH ELECTRIC' draw-out relay cases. These cases have amply proved their reliability under varying conditions of service and are standard for all relays.

- **Simplify testing and maintenance**
- **Economise in space**
- **Straightforward design gives ease of operation**
- **Contacts resist corrosion**

For full details, write for Publication MS/3802B

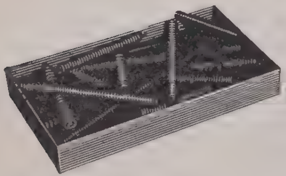
METER RELAY AND INSTRUMENT DIVISION, STAFFORD

The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

RL.45

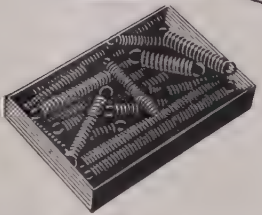
EXPERIMENTAL SPRINGS?

No. 1217
One gross Assorted Springs.
45/-

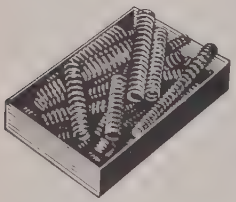


No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. **15/-.**

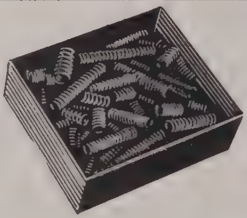
No. 98A. Three dozen Assorted 1" to 4" long, ½" to ¾" diam., 19G to 15G. **6/6.**



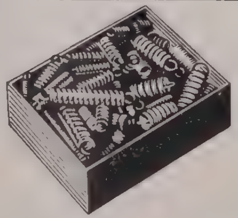
No. 753. Three dozen Assorted Light Expansion ¼" to ½" diam., 2" to 6" long, 22 to 18 S.W.G. **12/-.**



No. 760. Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., ¼" to ½" diam. **7/6.**



No. 757. Extra Light Compression, 1 gross Assorted, ⅛" to 7/16" diam., ½" to 2½" long, 27 to 19 S.W.G. **18/-.**



No.758. Fine Expansion Springs. 1 gross Assorted ⅛" to ⅜" diam., ½" to 2" long, 27 to 20 S.W.G. **18/-.**

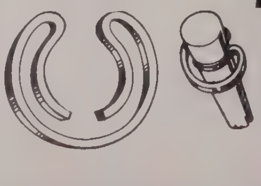
That spring you want . . .
in a hurry . . . *where* is it?
Pick *what* you want *when* you want it from TERRY'S BOXES OF ASSORTED SPRINGS—our fine range of small boxed assortments of experimental springs. We can show you only a few from the range here. Send a postcard for our full list—and if ever you're stuck with a spring problem send it along to our Research Department—they'll gladly help you out.

Have you a Presswork problem?

If so, the help of our Design Staff is yours for the asking.

TERRY'S
for SPRINGS

Really interested in Springs? "Spring Design and Calculations" 10th Edition tells all—post free 12/6.



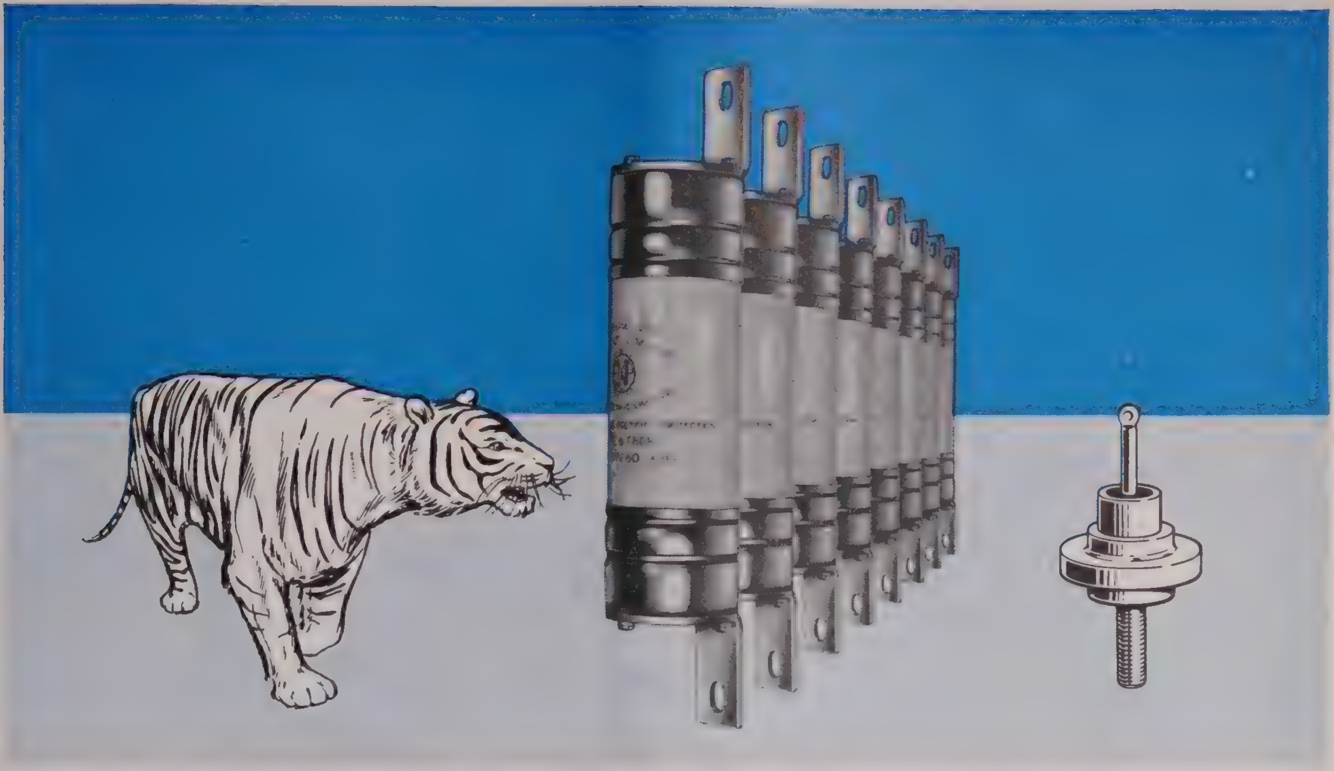
Cut Production Costs with Terry's Wire CIRCLIPS. We can supply immediately from stock—from ⅛" to ⅝".

Looking for good Hose Clips? Send for a sample of Terry's Security Worm Drive Hose Clip and price list.

HERBERT TERRY
& SONS LTD
Redditch, Worcs.

(Makers of Quality Springs, Wireforms and Presswork for over 100 years)

HT31



Semi-conductor rectifiers are not likely to be the prey of Tigers, which are notoriously carniverous in their selection of victims. Nevertheless, these rectifiers do need protection from the more serious hazards of excessive currents and transient voltages. Complete protection can now be obtained from the range of EMP H.R.C. Fuse-Links and Surge Diverters.

FUSE LINKS

SPECIFICALLY DEVELOPED with melting time/current characteristics matching the rectifier survival characteristics, the fuse-links incorporate shaped elements designed to limit the maximum transient arc voltage to less than 1·5 times the peak of the rated value. The fuse-links are available for both *medium* and *high voltage* applications.

★ Type tested to meet the most onerous fault duties.
★ Ratings: M.V. from 10A to 800A up to 650V (P.I.V.)
H.V. from 10A to 300A up to 6kV (P.I.V.)
★ Fitted with indicating devices and/or striker pins.

SURGE DIVERTERS

SPECIFICALLY DEVELOPED for a.c. or d.c. semi-conductor rectifier applications, the Surge Diverters are designed such that rapid and consistent low value spark-over of gaps is ensured — even for times to spark-over measured in tenths of a microsecond.

★ Surge protection down to 500V.
★ Special traction duty range.
★ D.C. types incorporate magnetic arc-control.

EMP ELECTRIC LIMITED

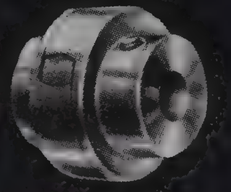
GARMAN ROAD, LONDON, N.17
Tel: Tottenham 5591 (5 lines) Grams: " Arrester, London "

IT/EEI

RENOLD

Power transmission accessories

When it's a question of



Spider Type Flexible Couplings — range of 6 couplings up to 20 h.p.

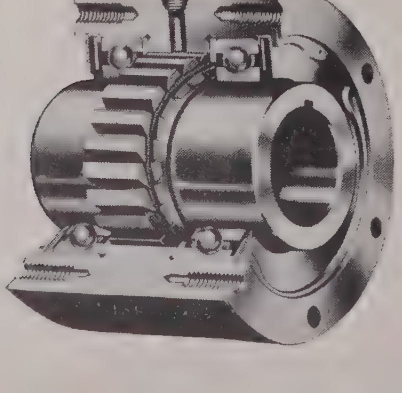
Disc Type Flexible Couplings — range of 16 couplings up to 600 h.p.

coupling one shaft to another . . .

RENOLD couplings are the answer !

Chain Couplings — range of 11 couplings up to 1,500 h.p.

Sturdy and compact, Renold Couplings have for many years proved their value on a wide variety of applications — and they are AVAILABLE FROM STOCK. For complete information ask for Catalogue Ref. 116/110.



RENOLD SPRAG CLUTCHES

For Over-running, Indexing and Backstopping

The Renold Sprag Clutch has many uses in all types of machinery and is ideal for the replacement of noisy ratchet-and-pawl mechanisms. It will give completely positive indexing with speed, accuracy and to unlimited graduations, is capable of high speed free-wheeling, and will remain free from measurable backlash throughout its life.

Write to Renold Chains Limited, Sprag Clutch Unit, 50 Cathedral Road, Cardiff, for Catalogue giving details of our comprehensive range of over 70 standard sizes. Renold Chains Limited are licensed to manufacture Sprag Clutches by Formsprag Co., U.S.A.

RENOLD CHAINS LIMITED • MANCHESTER

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ARE
INDUSTRIAL METALS

OFFERING THESE OUTSTANDING PROPERTIES

High Temperature Stability
Exceptional Chemical Inertness
Low Vapour Pressure
Superior Wear Resistance
Peak Catalytic Activity

Accurate temperature measurement—that's the rule in melting high-nickel alloys at the works of Henry Wiggin and Company Limited. Platinum Metal thermocouples are accurate, reliable and have a long life under the severest conditions.

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Engelhard Industries Limited fabricate and market the Platinum Metals refined by The International Nickel Company (Mond) Limited

Some Industrial uses of
PLATINUM METALS

A platinum metal may be the *cheapest* answer to a heat or corrosion problem.

Send for this booklet to:

ENGELHARD INDUSTRIES LTD

Baker Platinum Division
52 High Holborn
LONDON WC1

TGA PM2

The castings shown are components of an English Electric high speed resistor tap changer for a very high power transformer. Although of complicated design they were cast by simple methods made possible by the unique properties of Araldite epoxy resins. Araldite can be used for gravity casting or mixed and poured under vacuum. Shrinkage on setting is lower than with any comparable material, so that castings of great accuracy and uniformity of dimension are assured. Metal inserts are cast *in situ*, by virtue of the remarkable adhesive properties of Araldite. The finished components have excellent electrical and mechanical properties, high resistance to tracking, and are unaffected by water or chemicals. May we send you our booklet "Araldite Resins for the Electrical Industry?"

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CIBA (A.R.L.) LIMITED, DUXFORD, CAMBRIDGE. TELEPHONE: SAWSTON 2121

AP.614

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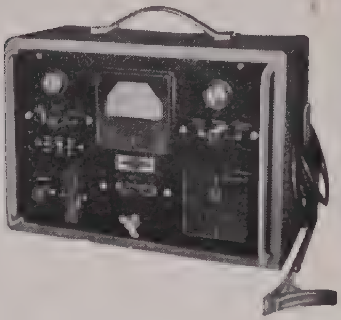
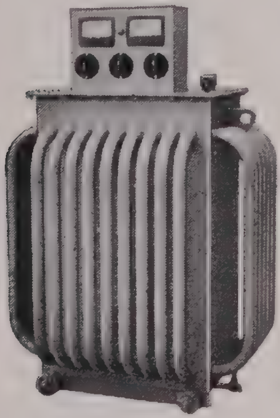
conforming to :

I.E.E. Regulations, 13th Edition 1955, Section 5 (as amended December 1958). This instrument will safely carry out tests on electrical installations and appliances.





TRANSFORMERS UP TO 100 K.V.A.

RECTIFIERS UP TO 40 K.W. D.C.

BATTERY CHARGERS — SINGLE AND MULTIPLE CIRCUIT

LOW VOLTAGE INDUSTRIAL LIGHTING BRACKETS AND PORTABLE TOOL TRANSFORMERS

We specialise in the manufacture of Industrial Electrical Equipment to your specification.

'Tailor Made' to exact Requirements.

MERITUS (BARNET) LTD.
BARNET, HERTS. *BAR 2291/2*

ESSENTIAL

for sampling

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MERCURY VAPOUR CONCENTRATION METER Type E.3472

Measures concentration of mercury vapour present in air. Essential where quantities of mercury are regularly used or where danger exists of leakage of mercury vapour from apparatus.

Two sensitivities are available at the touch of a switch, giving either full scale reading at a concentration of 770 micro-grammes per cubic metre of air or full scale meter reading at a concentration of 200 micro-grammes. Terminations are provided at rear for operation of a recorder to give continuous readings of concentration present.

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HENDREY RELAYS LTD. - BATH ROAD SLOUGH BUCKS.
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CONTROL AND LABORATORY APPARATUS
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there is a size of Weldmesh suitable
for your requirements

Cut it to the shape you want—it holds together because it is welded together

Weldmesh is a registered trade mark and is supplied in rolls or sheets direct to the users by the sole manufacturers:

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M-W 1017

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CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED:—53/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

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OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF CHATHAM

Street Lighting Programme

Conversion Scheme Gas to Electricity

TENDERS are invited for the supply and erection of approximately 1,080 Class B Street Lighting Units within the Borough Boundaries. The columns and lanterns are to be obtained from already approved nominated suppliers and the contract will include the supply of columns, lanterns and control gear, the erection and wiring of all the equipment, together with the permanent reinstatement of all carriageways and footways and all ancillary works.

The form of tender, general and special conditions of contract, specification and bill of quantities may be obtained from, and the drawings inspected at, the office of Mr. J. A. T. Richards, Borough Engineer and Surveyor, Town Hall, Chatham, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender or the return of all issued documents before the closing date for receipt of tenders.

Tenders must be delivered in accordance with the conditions of tender to the undersigned not later than 12 noon on Monday, 4th September, 1961.

The Council do not bind themselves to accept the lowest or any tender.

ROWLAND NEWNES,
Town Clerk.

Town Hall,
Chatham.

1903

Re-Advertisement

COUNTY BOROUGH OF BRIGHTON WATER DEPARTMENT

Patcham Pumping Station

Remote Automatic Control Equipment

FIXED PRICED TENDERS INVITED for the MANUFACTURE, DELIVERY, ERECTION, TESTING and SETTING IN OPERATION equipment for REMOTE and LOCAL AUTOMATIC CONTROL of Electrically Driven Submersible Well and Surface Booster Pumps.

Specification and particulars from Chief Engineer, Water Department, 12, Bond Street, Brighton, on payment of two guineas deposit, to be refunded on receipt of a bona fide tender and return of all documents.

Tenders in plain sealed envelopes not bearing any name or mark indicating the sender, and endorsed "REMOTE CONTROL, PATCHAM PUMPING STATION," to be delivered to me by noon on 2nd October, 1961.

The Corporation do not bind themselves to accept the lowest or any tender.

W. O. DODD,
Town Clerk.

Town Hall,
Brighton.

1960

BOROUGH OF STOCKTON-ON-TEES

Re-Lighting of Trunk Road A.19

SEPARATE tenders are invited for the supply only of:—

(a) 13 Reinforced Concrete Group "A" Lighting Columns.

(b) 13 140-watt S.V.D. Lamps, Lanterns and ancillary equipment.

Forms of tender, conditions of contract and specifications may be obtained from Gilbert Cowan, Esq., A.M.I.C.E., Borough Engineer and Surveyor, Municipal Buildings, Church Road, Stockton-on-Tees, on payment of a deposit cheque of £2 2s. in respect of Tender (a) and £2 2s. in respect of Tender (b).

Applicants should state their requirements of either or both forms of tender and upon receipt of a bona fide submission deposits will be returned.

Tenders enclosed in the endorsed envelopes provided must be delivered to the undersigned not later than 12 noon on Friday, 8th September, 1961.

JOHN A. HAWORTH,
Town Clerk.

Municipal Buildings,
Church Road,
Stockton-on-Tees.

2010

POYNTON-WITH-WORTH PARISH COUNCIL

TENDERS are invited for the installation of Class "A" Lighting on the trunk road at Poynton, consisting of the provision and erection of 55 Concrete Columns and Sodium Lanterns.

Forms of tender, specifications and bills of quantities may be obtained from the Council Offices, where the layout plan may be seen.

Tenders to be submitted to the undersigned in plain sealed envelopes marked "Class 'A' Lighting" by noon on Monday, 18th September, 1961.

GEORGE H. WAINWRIGHT,
Clerk of the Council.

Council Offices,
220, Park Lane,
Poynton, Stockport.

1974

BOROUGH OF WATFORD

Central Library Extension: Electrical Work

TENDERS are invited for stripping existing wiring, re-running conduits and supplying and fixing all new distribution boards, fuse boards, etc., with lighting and power fittings.

Applications for documents must be made to Mr. F. C. Sage, Borough Engineer and Surveyor, Town Hall, Watford, not later than 2 p.m. on 25th August, 1961.

Contract documents will be forwarded as soon as possible after that date.

GORDON H. HALL,
Town Clerk.

Town Hall, Watford.

1986

COUNTY BOROUGH OF WIGAN

To Electrical Contractors

166 Dwellings, Giants Hall, Beech Hill Housing Estate
43 Dwellings, Laithwaite Housing Estate
3 Police Houses, Warrington Rd. Goose Green

TENDERS are invited from experienced electrical contractors for the COMPLETE WIRING INSTALLATIONS of dwellings in each of the above schemes.

The specification and particulars of the electrical installations for each scheme can be obtained on application to the Borough Engineer, Municipal Buildings, Howlett Street, Wigan, on payment of a deposit of £1 1s. (cheques payable "Wigan Corporation"), which will be refunded on receipt of a bona fide tender.

Contractors can submit a tender for each scheme or for one scheme only, but each tender must be submitted separately in the appropriate endorsed official envelope provided for the purpose, which must be sealed and delivered to the undersigned not later than 10 a.m. on Wednesday, the 6th September, 1961.

All tenders must allow for being subject to the Council's Standing Orders concerning contracts, which include a requirement for the provision of sureties.

The Council does not bind itself to accept the lowest or any tender.

ALLAN ROYLE,
Town Clerk.

Municipal Buildings,
Wigan.

1958

CARSHALTON URBAN DISTRICT COUNCIL

Supply and Erection of Street Lighting Columns and Equipment: Stage V (Balance)

TENDERS are invited for the supply and erection of 556 Concrete Lighting Columns (15 ft. mounting height) with equipment.

26 for high-standard Group "B" Sodium lighting.

530 for Tungsten lighting.

Form of tender, specification and bill of quantities may be obtained from the Engineer and Surveyor, Stone Court, The Grove, Carshalton, Surrey.

Tenders enclosed in the envelope provided are to be returned to the Chairman of the Council not later than noon on Wednesday, 6th September, 1961.

The Council do not bind themselves to accept the lowest or any tender.

C. H. DURRANT,
Clerk of the Council.

District Council Offices,
The Grove,
Carshalton, Surrey.

2008

Official Notices *(continued)*

BOROUGH OF UXBRIDGE

TENDERS are invited from electrical contractors who are members of N.I.C.E.C. for work in connection with the undermentioned contracts :—

Contract No. 111 : 150 Houses, Hillingdon
Contract No. 112 : 152 Houses, Hillingdon
Contract No. 113 : 130 Houses, Cowley

The work will consist of the re-wiring of existing lighting circuits and the provision of a ring main power circuit with additional points for cooker and immersion heater in each house. Forms of tender and specification may be obtained from A. W. Caudery, A.I.Hsg., M.R.S.H., Housing Manager, 267, High Street, Uxbridge.

Tenders to be returned to the undersigned in the envelope provided, marked " Tender for Contract No. 111/112/113," and bearing no other mark or indication of the sender, not later than 9 a.m. on Monday, 11th September. The Council do not bind themselves to accept the lowest or any tender.

E. RONALD WEST,
Town Clerk.

265, High Street,
Uxbridge, Middlesex.

1959

BOROUGH OF MORLEY

Street Lighting Department

Trunk Road Lighting, A.62

TENDERS are invited for the supply, installation and putting into service of 52 totally enclosed 140-watt Sodium Street Lighting Units on 25-ft. concrete columns on the above road. 22 of these columns must each be capable of supporting a pair of overhead feed wires.

Forms of tender may be obtained from the Public Lighting Engineer, Town Hall, Morley, and must be returned to the undersigned, endorsed " Street Lighting Tender " not later than Saturday, 16th September, 1961.

E. V. FINNIGAN,
Town Clerk.

Town Hall,
Morley, Yorkshire.

2009

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Awe Project

16.5-MVA, 132/11-kV Transformer and Auxiliary Transformer for Nant Power Station

TENDERS are invited for the above Transformers. Tender documents may be obtained from the Engineers, Messrs. Strain & Robertson, 5, Park Circus, Glasgow, C.3, on receipt of a deposit of £2 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

1985

THE CORPORATION OF GLASGOW

OFFERS are invited for the supply of 5,000 Mild Steel Bracket Fittings for Electrical Stairlighting. A sample may be inspected and a specification and form of offer obtained at the Lighting Department, 20, Trongate, Glasgow. Offers to reach me by 7th September, 1961.

ALEXANDER ROOKE,
Town Clerk.

City Chambers, Glasgow.

2022

CLASSIFIED ADVERTISEMENTS ARE PREPAID

SITUATIONS VACANT

(See " Replies to Box Numbers " on page 91)

YORKSHIRE ELECTRICITY BOARD

Head Office
Chief Engineer's Department

SECOND ASSISTANT ENGINEER
(Operation).

Applicants should have experience in the operation of a large interconnected distribution system; knowledge of the plant and equipment comprising such systems is essential.

The successful candidate will be required to assist in the determination of system operation policy, the administration of regional control centres, and the evaluation of system performance.

SECOND ASSISTANT ENGINEER
(Measurements).

Applicants should have experience of modern protective gear systems and metering practice on an extensive distribution system. A knowledge of electronics, telemetering and communication systems is desirable.

The successful candidate will be required to investigate protective gear and metering problems and evaluate protective gear performance. In addition he will be required to participate in research projects undertaken by the Board.

Salary for both these posts is within the range of £1,415/£1,720 per annum (N.J.B. BX.5, transitional to Scale 14), the commencing salary being dependent upon qualifications and experience.

Chief Commercial Officer's Department

GENERAL ASSISTANT ENGINEER
(Commercial).

A vacancy exists in the Tariffs and Statistics Section for an assistant who will deal mainly with utilisation research within the Area. This work entails the collection and analysis of sample survey data. In addition the assistant will do other work involving report writing and lengthy calculations, therefore some proficiency in Mathematics and English is desirable. The successful applicant should be able to work accurately and with concentration.

Salary N.J.B. Class BX, Grade 13, within the range £770/£1,015 per annum (transitional to Scale 6).

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, not later than 1st September, 1961.

No. 5 (Wakefield) Sub-Area
WAKEFIELD DISTRICT

FIRST ASSISTANT DISTRICT ENGINEER.

Applicants should be experienced in electricity supply, particularly in District organisation.

Experience in the operation, maintenance and construction of substations and mains, both overhead and underground, and in the planning and estimating of development schemes on an electricity distribution system with voltages up to 66 kV will be an advantage.

Salary N.J.B. Class H, Grade 5 (Scale 12), £1,350/£1,500 per annum.

This advertisement cancels the one which appeared in last week's issue.

S. A. H. Q.

THIRD ASSISTANT ENGINEER
(Meters, Testing and Protection).

Applicants should have had experience in the testing, commissioning and maintenance of protective gear, the location of H.V. cable faults and the testing and installation of metering equipment. The successful applicant will ultimately be required to undertake standby duties.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 1st September, 1961.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER
(Protection).

Applicants should have had experience in the testing and commissioning of electrical plant, preferably including protective gear.

Salary N.J.B. Class N, Grade 13 (Scale 9), £1,115/£1,245 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, 1, not later than 1st September, 1961.

2012

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

FOREMAN required in the Commercial Department, based at Mold, Clwyd District. Salary £880 per annum (Grade 1, N.J.I.C. Schedule E).

Duties will include the supervision of contracting work and consumer service.

Applicants should have served a full apprenticeship as an electrician, be well versed in the duties of an installation inspector, and be fully conversant with the current edition of the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers. They should also be able to assist in the preparation of schedules of materials for large contracting jobs and should, therefore, have had experience of all systems of electrical installations for domestic, commercial and industrial premises. Previous experience of control of staff would be an advantage.

Good holiday, sick pay and pension schemes.

Applications, on forms obtainable from the District Manager, MANWEB, Abbey House, Rhyl-Road, Rhuddlan, should be completed and returned to him not later than 25th August, 1961.

1965

GRANADA TV

requires a

PLANT ENGINEER

for their MANCHESTER TV CENTRE. He will take charge of the operation and maintenance of all heating and ventilation, electrical power and mechanical equipment installed in the Centre. Plant for which he will be responsible includes H.P.H.W. boiler house and distribution network, together with L.P.H.W. boiler house and heating systems, eleven ventilation plants, electronic, electric and pneumatic, and automatic controls, H.V. and M.V. electric power distribution, compressed air supplies, etc.

Applicants must be qualified engineers and have served a recognised apprenticeship and have had experience in a position of responsibility in an industrial plant or as a seagoing engineer. 5-day week and generous pension and life assurance scheme.

Write, giving details of qualifications, experience and present salary to Norman Price, Personnel Manager, The Granada TV Network Ltd., Television House, Manchester, 3.

1947

THE PUBLIC SERVICE OF PAPUA AND NEW GUINEA

Electrical Undertakings Branch

Electrical Engineer

Grade 2 (Design)

£A2011-£A2231 p.a. (single)
£A2161-£A2381 p.a. (married)

QUALIFICATIONS: Degree or diploma in electrical engineering or qualified for admission to a recognised institute or equivalent professional qualification; technical background in mathematical treatment of design problems.

DUTIES: Survey system load growth and assess future plant requirements; investigate system conditions; prepare designs, specifications, estimates and drawings for lines, substations and generating plant.

SALARY: Rates quoted are actual and include cost of living adjustment and allowance (totalling £A533 p.a. married and £A383 p.a. single). Additional allowances are payable after 5 and 7 years' service. In addition the rates of salary may be subject to adjustment as a result of a recent Arbitration decision.

TAXATION: Income tax is less than half that payable in the United Kingdom for the same taxable income.

ELIGIBILITY: Adult British subject under 45 years.

APPOINTMENT. Permanent on probation.

LOCATION: The Territory of Papua and New Guinea comprises the eastern half of the main island of New Guinea and adjacent islands lying north-east of Australia towards the equator. Appointees would be stationed at the largest town, Port Moresby (approximately 1,800 miles by air from Sydney), but may be required to serve anywhere in Territory.

ACCOMMODATION: Single quarters available; married accommodation unlikely to be available under 18 months from date of appointment.

SEPARATION ALLOWANCE: Payable at discretion of Territory Administration; designed to compensate for added expense of married appointees obliged to maintain family outside Territory.

CHILD ALLOWANCE: For first dependent child under 16 years—£A52 p.a. For subsequent dependent children under 16 years—£A65 p.a. All officers receiving adult male rates of salary are required to contribute £A26 p.a. towards cost of allowance.

LEAVE: Three months on full pay after each 21 months in Territory. Additional 3 months' leave after each 6 years. Six months' furlough after 20 years.

FARES: *On Appointment:* The fares of the appointee and wife and dependent children under 16 will be paid from place of residence overseas to the Territory, but movement of wife and family beyond Sydney (Australia) would not be permitted until married accommodation is available in Territory.

On Leave: Return fares will be paid each two years for appointee and wife and dependent children under 16, when proceeding on approved recreation leave, from Territory to Sydney (Australia) or pro rata to other places: subject to contribution by officer of £A12 10s. 0d. single, £A15 0s. 0d. married.

FURTHER INFORMATION: Further particulars, an information handbook on the Territory and its Public Service and a statement on taxation are available from the Recruitment Officer, Staff Branch, Australia House, Strand, London, W.C.2, or the Department of Territories, Canberra, Australia.

APPLICATIONS: Submit on application form available from above offices quoting ADVERTISEMENT No. 18, to The Secretary, Department of Territories, Canberra, A.C.T., AUSTRALIA by 30th September, 1961.

1988

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

SECTION ENGINEER required in the Liverpool South District. Salary is within the range £1,275/£1,410 per annum (N.J.B. Class J, Grade 7).

Applicants should preferably have technical qualifications and should have had experience in the construction, operation and maintenance of systems up to and including 33 kV.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 25th August, 1961.

1969

CROMPTON PARKINSON (CHELMSFORD) LTD.

require a

CHIEF OF ROTATING MACHINE TEST

THE company manufactures industrial A.C. motors/generators up to 4,000 h.p./kVA, industrial D.C. Motors/generators up to 1,500 h.p./kW, and traction D.C. motors/generators up to the largest sizes. The applicant is to be responsible for the testing of the whole of this equipment.

Apply in confidence giving particulars of age, experience and qualifications to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Writtle Road, Chelmsford.

1952

JAMAICA

Instrument Supervisor

APPLICATIONS for above position are invited from qualified electrical engineers familiar with instrumentation, preferably in chemical plants.

Attractive salary, pension plan, good housing on rental basis, overseas leave every three years with return travelling expenses paid.

Please give full details of qualifications and experience and ages of children (if any) to—Box G.242, c/o Streets, 110, Old Broad Street, London, E.C.2.

1991

NORTH WESTERN ELECTRICITY BOARD

Second Assistant Engineer (Power Sales), Sub-Area Commercial Department, Manchester

Applicants should be qualified to advise consumers on the application of electricity to industrial processes, especially in the engineering, chemical and textile industries. Some knowledge of space and process heating is desirable.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,535/£1,720 p.a., Grade M.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493 and returned to him by 28th August, 1961.

Third Assistant District Engineer, Bury District

The duties will include assisting the District Engineer in the construction, operation and maintenance of the 33-kV, 11-kV and low-voltage distribution systems.

The possession of the H.N.C. and Graduate Membership of the Institution of Electrical Engineers would be an advantage.

Salary scale £1,040/£1,165 p.a., Grade H.9. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and returned to him by 28th August, 1961.

1993

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Appointment of Third Assistant Engineer, Steam Testing Department, Dunston

APPLICATIONS are invited to fill a vacancy for a Third Assistant Engineer in the Plant Performance Testing Section, based at Dunston-on-Tyne.

Candidates should have the technical qualifications for admission to associate membership of a recognised institution.

Experience of operation, testing, design or experimental development of modern high-pressure steam plant is required.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Grade 8, Class J (£1,105-£1,325 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 25th August, 1961.

2005

ESTIMATOR

required by

ELECTRIC MOTOR MANUFACTURERS

S.E. LONDON DISTRICT

TO PREPARE TENDERS FOR SPECIALISED PLANT

Permanent Position. Attractive Salary. Good Prospects

Contributory Pension Scheme

Box No. 1905

Situations Vacant *(continued)*

EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate vacancy number.

Ilkeston and North Derbyshire Sub-Area

SECOND ASSISTANT ENGINEER
(Technical and Substations)
(Vacancy No. 94/61).

Salary N.J.B. Class K, Grade 7, £1,350 to £1,500 per annum.

The duties will include assisting in protective systems, fault location, commissioning and testing of transformers, switchgear and other apparatus.

Applicants should possess the Higher National Certificate in Electrical Engineering or an equivalent qualification, and should be familiar with the installation of electrical plant including transformers, switchgear, etc., and all ancillary equipment up to and including 66 kV, and should be able to interpret and check switchgear and manufacturers' drawings.

Applications should be forwarded to the Manager, Ilkeston and North Derbyshire Sub-Area, 1, Derby Road, Ilkeston, Derbyshire, by the 8th September, 1961.

Lincolnshire Sub-Area

DEMONSTRATOR, BOSTON DISTRICT
(Vacancy No. 95/61).

Salary N.J.C. Grade 1, £600 × £25 to £700 per annum.

The duties will include conducting demonstrations in service centres, general duties, including sales and advice to consumers on the selection and use of electrical appliances both at the service centres and on consumers' premises.

Applicants must be over 21 years of age and should hold the E.A.W. Electrical Housecraft Certificate. Ability to drive a motor vehicle is desirable.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North House, Grantham, Lincolnshire, by the 8th September, 1961.

Northamptonshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER, BLETCHLEY DISTRICT
(Vacancy No. 96/61).

Salary N.J.B. Class F, Grade 7, £1,040 to £1,165 per annum.

The duties will include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

Ability to drive a car is essential. The successful applicant will be required to reside within the District and to undertake standby duties.

Applications should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, by the 8th September, 1961.

Nottingham Sub-Area

FOURTH ASSISTANT DISTRICT ENGINEER
(Vacancy No. 97/61).

Salary N.J.B. Class G, Grade 13, £715 to £805 per annum.

The duties will include assisting in the operation, maintenance, planning and construction of networks up to and including 11 kV.

The successful applicant must live in or near to Nottingham.

Applications should be forwarded to the Manager, Nottingham Sub-Area, 35/39, Carrington Street, Nottingham, by the 8th September, 1961.

Mansfield & North Nottinghamshire Sub-Area

GENERAL ASSISTANT ENGINEER
(Vacancy No. 98/61).

Salary N.J.B. Class L, Grade 14, £890 to £1,015 per annum.

The duties will include assisting in the planning and preparation of schemes and specifications for the extension and reinforcement of overhead and underground distribution systems up to and including 11 kV, and the design and layout of substations.

Applications should be forwarded to the Manager, Mansfield and North Nottinghamshire Sub-Area, Lime Tree Place, Mansfield, Nottinghamshire, by the 8th September, 1961.

Derby and Burton Sub-Area

THIRD ASSISTANT COMMERCIAL ENGINEER
(Vacancy No. 99/61).

Salary N.J.B. Class K, Grade 9, £1,190 to £1,325 per annum.

The duties will include assisting in the development of supply, utilisation, negotiations with consumers and assisting in the activities of the Sub-Area Commercial Department.

Applications should be addressed to the Manager, Derby and Burton Sub-Area, Electricity Offices, Irongate, Derby, in an envelope endorsed "Confidential, Third Assistant Commercial Engineer," by the 8th September, 1961.

1930

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

Regional Research and Development Dept.

Transmission Section Head

APPLICATIONS are invited for the position of TRANSMISSION SECTION HEAD in the Electrical Branch of the above Department located at West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts.

The successful candidate will be required to lead a team on research and development work entailing a reasonable amount of field work on overhead lines, underground cables, switching and transforming stations and associated equipment. In addition he is responsible for a Specialist Engineer engaged on cathodic protection and buried corrosion.

Applicants should have a sound technical training with experience in electrical power system work. A recognised electrical engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers is essential and a University Degree would be an advantage.

The salary, inclusive of London allowance, depending on experience, is within the range of £1,500/£2,145 per annum in accordance with Class L, Grade 3/4/5 of Schedule A of the National Joint Board Agreement.

Applications stating age, qualifications, experience, etc., should be addressed to the Regional Secretary, Ergon House, Horseferry Road, London, S.W.1, so as to arrive by not later than 1st September, 1961.

1978

SALES REPRESENTATIVE

required for

SPECIALISED AND MARINE ELECTRIC MOTOR CONTROL GEAR

Attractive remuneration. Contributory pension scheme.

Box No. 1904

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

First Assistant District Engineer

APPLICATIONS are invited for the post of FIRST ASSISTANT DISTRICT ENGINEER in the Lewis District.

The District Office is in Stornoway where the successful candidate is required to operate.

The District is predominantly rural, embracing the Islands in the Outer Hebrides, and the post provides work of an interesting and varied nature which at times necessitates travel by sea and air.

Applicants should have experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary apparatus.

Minimum technical qualifications: Ordinary National Certificate in Electrical Engineering.

Salary N.J.B. Class C, Grade 5, £965-£1,000.

Superannuation scheme applicable.

Application forms, obtainable from Area Manager, Church Street, Dingwall, should be returned completed by 31st August, 1961.

1963

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

DEMONSTRATOR required in the Crewe District of the Board's No. 4 Sub-Area, based on Crewe.

Salary within the range £600/£700 per annum (N.J.C. Grade 1).

Candidates should be over 21 years of age, with demonstrating experience, and should have a good knowledge of electrical appliances. They should be competent to arrange and give public demonstrations of cooking, laundering and housecraft subjects. The possession of a recognised diploma in domestic science or other approved certificate desirable.

The post is active and interesting, involving wide contact with the public, particularly women's organisations, schools and housewives.

Possession of a current driving licence would be an advantage. Good holiday, sick pay and pension schemes. Appointment subject to medical examination.

Standard application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham, or from any District Office. Closing date 25th August, 1961.

Previous applicants need not re-apply.

1966

MIDLANDS ELECTRICITY BOARD

Appointment of Chief Engineer

APPLICATIONS are invited for the post of Chief Engineer to succeed Mr. G. S. Buckingham, B.Sc., M.I.E.E., on his appointment as Deputy Chairman of the Board. The successful applicant will be expected to take up the appointment on 1st December, 1961.

Candidates must be Corporate Members of the Institution of Electrical Engineers and should have had wide experience in a large electricity supply organisation.

The salary will be between £4,000 and £4,750 per annum.

Applications giving full details of age, qualifications, experience, present salary and position should be forwarded to the Chairman of the Board at Mucklow Hill, Halesowen, nr. Birmingham, to arrive not later than 8th September, 1961.

2006

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Mechanical),
NORTH WILFORD POWER STATION
(Vacancy No. 181/61).

Applications are invited for the post of Assistant Maintenance Engineer (Mechanical) at North Wilford Power Station, Queens Drive, Nottingham. Applicants should be suitably qualified and have received a sound technical training with practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are associate members of a recognised institution or possess similar qualifications.

Salary will be in accordance with Class K, Grade 8 (£1,275-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th August, 1961.

ASSISTANT MAINTENANCE ENGINEER (Electrical),
NORTH WILFORD POWER STATION
(Vacancy No. 182/61).

Applications are invited for the post of Assistant Maintenance Engineer (Electrical) at North Wilford Power Station, Queens Drive, Nottingham. Applicants should have received a thorough technical and practical training followed by considerable experience in testing and protective gear, maintenance of alternators, transformers, switchgear and associated equipment.

Preference will be given to candidates who are associate members of a recognised institution or who possess similar qualifications.

Salary will be in accordance with Class K, Grade 8 (£1,275-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th August, 1961.

ASSISTANT ENGINEER (Operation),
HIGH MARNHAM POWER STATION
(Vacancy No. 184/61).

Applications are invited for the position of Assistant Engineer (Operation) at High Marnham Power Station, near Newark, Notts. Applicants should have experience of the operation and control of modern high-pressure boiler and turbine plant, and should possess H.N.C. in Mechanical or Electrical Engineering, but consideration will be given to those holders of a lower technical qualification who have sound operating experience.

Salary will be in accordance with Class N, Grade 10 (£1,350 - £1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 25th August, 1961.

GENERAL ASSISTANT ENGINEER
(Mechanical Maintenance),
DRAKELOW "A" and "B"
POWER STATIONS
(Vacancy No. 189/61).

Applications are invited for the position of General Assistant Engineer (Mechanical Maintenance) at Drakelow "A" and "B" Power Stations, near Burton-on-Trent. Preference will be given to candidates who hold the Higher National Certificates or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825 - £940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1st September, 1961.

ASSISTANT PLANNING ENGINEER,
WILLINGTON "A" and "B"
POWER STATIONS
(Vanancy No. 190/61).

Applications are invited for the position of Assistant Planning Engineer at Willington "A" and "B" Power Stations, P.O. Box No. 27, Derby. Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440 - £1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1st September, 1961.

ASSISTANT EFFICIENCY ENGINEER,
DRAKELOW "A" and "B"
POWER STATIONS
(Vacancy No. 191/61).

Applications are invited for the position of Assistant Efficiency Engineer at Drakelow "A" and "B" Power Stations, near Burton-on-Trent. Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440 - £1,610 per annum) of the National Joint Board Agreement.
Closing date for receipt of applications, 1st September, 1961.

SHIFT CHARGE ENGINEER,
WARWICK POWER STATION
(Vacancy No. 192/61).

Applications are invited from qualified engineers for the position of Shift Charge Engineer at Warwick Power Station, Emscote Road, Warwick. Applicants should have had experience in the operation of steam turbine and boiler plant.

Salary will be in accordance with Class E, Grade 7 (£965 - £1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 1st September, 1961.

GENERAL ASSISTANT ENGINEER
(Electrical Maintenance),
WILLINGTON "A" and "B"
POWER STATIONS
(Vacancy No. 194/61).

Applications are invited from suitably qualified engineers for the position of General Assistant Engineer in the Electrical Maintenance Department at Willington "A" and "B" Power Stations, P.O. Box No. 27, Derby, which is one of the largest power station groups in Europe. The successful applicant will receive training in all aspects of electrical maintenance and be expected to play a full part in the routine work of the department.

The salary will be within Class M, Grade 16 (£825-£940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1st September, 1961.

These positions are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned, and should be returned to him by the date stated.

FOURTH ASSISTANT ENGINEERS
(Testing),
DIVISIONAL HEADQUARTERS,
NOTTINGHAM
(Vacancy No. 193/61).

Applications are invited for the positions of Fourth Assistant Engineers (Testing) at Divisional Headquarters, Nottingham. Applicants should have received a thorough engineering and technical training and preferably experience in operating and testing modern high-performance steam generating plant, or in the field of non-destructive testing of materials.

The salary will be in accordance with Class L, Grade 11 (£920-£1,245 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1st September, 1961.

This appointment will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Administrative Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box No. 25, Barker Gate, Nottingham, and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.

2011

BRITISH OVERSEAS AIRWAYS CORPORATION

invite applications from

Qualified Electrical and/or Mechanical Engineers

for positions in their Properties and Services Branch at London Airport.

Appointments are immediately available for two Engineers who wish to work with a progressive and expanding organisation on a variety of interesting work.

Salary range £1,287 10s. to £1,627 10s. per annum.

The successful applicants will be responsible for all works associated with the installation of and alterations to industrial power, lighting, heating and ventilation and air conditioning schemes.

Application forms will be sent to suitable candidates, who should apply in the first instance giving brief details to:—

B. O. A. C.
The Recruitment Manager
London Airport, Hounslow, Middlesex

1990

Situations Vacant (continued)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT MANAGER,
Central Sussex District.

Applications are invited for the appointment of Central Sussex District Manager; the District Office is at Haywards Heath. Salary £2,170-£2,380 p.a. in accordance with Class C, Grade 5 of the N.J.M. & H.E. scales. The District serves some 38,000 consumers over a mixed urban and rural area of 298 square miles. The successful applicant may be offered housing accommodation.

Applications, quoting ER and naming 2 referees, to the Mid-Sussex Manager, SEEBOARD, Mid-Sussex House, North Road, Brighton, 1, in a "Confidential" envelope marked "Central Sussex District Manager," by 30th August, 1961.

ASSISTANT DISTRICT ENGINEER,
Guildford District.

Salary £1,040-£1,165 under N.J.B. Class F, Grade 7. Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of MV and 11-kV underground and overhead systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties.

Applications, quoting ER, on forms from District Manager, SEEBOARD, Woodbridge Road, Guildford, Surrey, by 30th August, 1961.

FIRST ASSISTANT DISTRICT ENGINEER, Sutton District.

Salary £1,275 to £1,410 p.a. plus London allowance under N.J.B. G.5, with progression to Grade 4 (max. £1,500) subject to satisfactory service. Superannuable. Applicants, with good technical qualifications, preferably with Corporate or Graduate Membership of the I.E.E., must have had a wide experience in electricity supply distribution covering the planning, construction, operation and maintenance of H.V. and M.V. systems.

The Sutton District (77,000 consumers) covers a dense urban area on the outskirts of London, and an engineer with considerable drive and initiative is required to progress a heavy reinforcement programme. Consideration will be given to a private car allowance and, in appropriate circumstances, to assistance with housing.

Applications, quoting ER, on forms from District Manager, SEEBOARD, 52, High St., Sutton, Surrey, by 30th August, 1961.

DISTRICT COMMERCIAL ASSISTANT,
Hastings District.

Salary £700 × £25 to £775 under N.J.C. Grade 2. Superannuable. The duties will consist mainly of estimating for contracting work, but the successful candidate may also be engaged on sales in any of the District showrooms or at exhibitions, etc. Sound practical experience of wiring systems is an essential qualification, together with the ability to advise consumers on tariffs and the utilisation of electricity generally.

Applications, quoting ER and naming 2 referees, on forms from District Manager, SEEBOARD, 12/13, York Buildings, Hastings, by 30th August, 1961.

GEORGE WRAY,
Secretary.

2013

DESIGNER-DRAUGHTSMAN

for transformer drawing office. Preference will be given to men possessing experience of large power transformers.

Salary up to £1,075 per annum commensurate with age, experience and qualifications.

Apply in first instance quoting personal details to Personnel Manager, Fuller Electric Limited, Fulbourne Road, Walthamstow, London, E.17.

2024

CONTROL ENGINEERS

AN expanding organisation in the West Midlands area engaged in the manufacture of electric control gear and electronic equipment has the following vacancies :—

MANAGER SALES/ESTIMATING DEPARTMENT

Applicants must possess drive and organising ability and have experience in the field of control gear engineering.

SALES ESTIMATING ENGINEERS

for the preparation of tenders for automatic schemes of control.

In both appointments there is considerable scope for advancement in a growing group of companies. Interview expenses and removal expenses met as appropriate.

Write to Box 1997 giving details of age, education and experience. All replies will be treated in strict confidence.

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

**Electrical Engineer's Department,
Croydon District**

ENGINEERS required to join a District team commissioning major electrical plant in generating and transforming substations in Surrey and maintaining automatic protective and control gear on such plant in that area.

Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualifications. The successful candidates will be required to live within approximately 10 miles of the District Headquarters at Croydon.

These positions offer good prospects to recently qualified engineers who are seeking a career in an interesting field.

The posts are designated Fourth Assistant Engineers (Technical). Salary range £940-£1,215 per annum including London allowance. The conditions of service are as decided by the National Joint Board with generous holidays and sick pay scheme and a contributory superannuation scheme.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Generating Board, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, to arrive by 21st August, 1961.

1977

CONSTRUCTORS JOHN BROWN
LIMITED

have several vacancies for

SUPERVISING ELECTRICAL ENGINEERS

APPLICANTS should have served a recognised full apprenticeship with a reputable electrical contractor, be educated to a reasonable technical standard and have experience of large industrial and flame-proof installations from estimating to final account stage.

The successful candidates would be required to reside on sites in the U.K. and abroad for periods of from one to two years. Good salaries and allowances.

Please apply in writing, giving details of age, experience and qualifications, to :

**Personnel Manager
CONSTRUCTORS JOHN BROWN
LIMITED
CJB House, Eastbourne Terrace
Paddington, London, W.2**

1926

NEW ZEALAND NAVY DEPARTMENT

APPLICATIONS are invited for the undermentioned vacancies :—

TECHNICIAN, NAVY DEPARTMENT, WAIOURU.

Initial salary would be up to £940 a year with opportunities for advancement to £985 a year on merit.

Duties: Repair and testing of teleprinters and naval communications equipment. Married and single accommodation is available at a reasonable rental. A remote allowance of £34 10s. a year to married men and £17 5s. a year to single men is also payable in addition to salary. Overtime is available.

TECHNICIAN (Radio),
NAVY DEPARTMENT, WAIOURU.

Initial salary would be up to £940 a year with opportunities for advancement to £985 a year on merit.

Qualifications desired: Experience in maintenance of shore W/T equipment including high-power transmitters and, if possible, electromechanical terminal equipment.

Duties: Testing, maintenance and repair of W/T transmitters and receiver equipment. Married and single accommodation is available at a reasonable rental. A remote allowance of £34 10s. a year to married men and £17 5s. a year to single men is also payable in addition to salary. Overtime is available.

Passages: Steamer fares of up to £172 each for the appointee and his wife and pro rata for dependent children will be paid.

Incidental expenses: Up to £35 for a single person and £100 for a married man can be claimed to cover the cost of taking personal effects to New Zealand.

Application forms and further details are available from the High Commissioner for New Zealand, 415, Strand, London, W.C.2, with whom applications will close on 8th September, 1961.

Please quote reference B13/15/1 when enquiring.

1971

UNIVERSITY OF BIRMINGHAM

APPLICATIONS are invited for appointment as PLANNING ENGINEER in the Bursar's Office to assist generally with planning of new buildings, particularly mechanical, electrical and other services. General engineering background required; degree or equivalent professional qualifications and experience of similar work an advantage.

Salary within the range £1,550 to £2,000 according to qualifications and experience.

Further particulars from the Bursar, The University, Birmingham, 15. Closing date 11th September.

2014

INDUSTRIAL PHOTOGRAPHER

to be responsible, under the Publicity Manager, for all photographic work in heavy electrical engineering works situated at Walthamstow.

Duties include technical records, publicity photography (monochrome and colour) in a wide range of applications.

This is a permanent pensionable position which has arisen due to the pending retirement of our present photographer.

Apply stating age, experience, qualifications and present salary to :—

Personnel Manager
FULLER ELECTRIC LIMITED
Fulbourne Road, Walthamstow, London, E.17

1941

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPLICATIONS are invited for the following superannuable appointments :—

SECOND ASSISTANT DISTRICT ENGINEER,
MOTHERWELL DISTRICT.
SECOND ASSISTANT DISTRICT ENGINEER,
RUTHERGLEN DISTRICT.

Candidates should have had sound engineering and technical training, with qualifications leading to Corporate Membership of the Institution of Electrical Engineers. They should have had experience with the maintenance and operation of H.V. and L.V. overhead and underground networks, and substations on a large distribution system. They should also be conversant with load flow diagrams, voltage drop, and short circuit calculations, and should have had experience with H.V. fault location.

Motherwell District: Salary N.J.B. Class G, Grade 7 (Scale 9), £1,115/£1,245 per annum.

Rutherglen District: Salary N.J.B. Class H, Grade 7 (Scale 10), £1,190/£1,325 per annum.

The successful applicants will require to reside within a reasonable distance of the respective District Offices.

Application forms, which can be obtained from the Area Manager, Montrose Crescent, Hamilton, should be returned to this office within 14 days of the date of this advertisement.

2004

MOTOR CONTROL GEAR

TECHNICAL REPRESENTATIVES

Bristol, Reading, London, Coventry, Glasgow

M.T.E. is a vigorously expanding company with a first-class product. Our standards are high, but in return we offer full product and sales training, good basic salary, incentive bonus, car allowance, pension scheme and an opportunity to join a successful progressive company.

If you are under 40, enthusiastic and have a sound knowledge of A.C. motor control gear, you may be one of the 5 first-class men we require for the above areas.

Local interviews will be arranged.

Applications stating age, present salary, position and experience to :—

MTE

M.T.E. CONTROL GEAR LTD.
Leigh-on-Sea, Essex

1961

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

Second and Third Assistant Engineers (Programmes)

APPLICATIONS are invited for appointments of Second and Third Assistant Engineers in the Programmes Department of the Midlands Project Group.

The selected candidates will be required to assist in the preparation of detailed programme charts for complete power station projects.

Candidates should preferably be corporate members of one of the recognised professional institutions and have served an engineering apprenticeship. Experience in the construction of heavy plant as installed in modern power stations either in a manufacturer's works or on site is essential, and a knowledge of civil engineering works involved would be an advantage.

The salary will be in accordance with the National Joint Board Agreement, Scale 15, £1,460 - £1,830 per annum, for the Second Assistant Engineer, and Scale 13, £1,320-£1,610 per annum, for the Third Assistant Engineer.

Applications should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, 341, Bournville Lane, Birmingham, 30, and should be returned to him not later than 28th August, 1961.

Envelopes should be marked "Confidential, Staff Vacancy No. MPG.54/61."

2018

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

SUB-AREA ENGINEER required in the Board's No. 4 Sub-Area based on Wrexham. The Sub-Area covers approximately 4,000 square miles, comprising the counties of Anglesey, Caernarvon, Denbigh, Flint, Merioneth and Montgomery and parts of the counties of Cardigan, Cheshire and Shropshire, and is divided into eight districts under District Managers.

The area is predominantly rural, but includes some large industrial supplies.

Salary in accordance with Scale N.J.M.5, i.e., £2,595 - £2,815 per annum.

Applicants should have appropriate technical qualifications, experience of the design, construction operation and maintenance of a large distribution system up to and including 33 kV, and the ability to direct the staff associated therewith.

Applications should be marked "Personal" and submitted to the Secretary at Board Headquarters, Electricity House, Love Lane, Liverpool, 3, so as to be received not later than the 26th August, 1961.

1878

We regret that due to a printer's error in this advertisement in a previous issue the position Sub-Area Manager should have read Sub-Area Engineer.

LONDON ELECTRICITY BOARD

Engineers (Construction)

APPLICATIONS are invited for the following appointments in the Construction Branch of the Chief Engineer's Department at Lesco House, Stamford Street, London, S.E.1.

ENGINEER (Construction) to supervise erection at various bulk supply substation sites within the Board's area of heavy electrical plant, including transformers, switchgear and auxiliary equipment, also supervision of laying, jointing and testing of underground cables. All this work is at voltages up to 66 kV. Applicants must have had previous experience of such work both in the factory and on outside construction. A knowledge of the handling of cable contracts will be necessary.

Corporate Membership of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers would be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement, Class K (Area) as Grade 5, £1,475 to £1,780 per annum inclusive of London allowance. (Ref. PER/V/3384/R.)

ENGINEER (Construction) (2) to assist in supervising the installation of electrical plant, including transformers, switchgear and cables at working pressures up to 66 kV, together with all auxiliary equipment. Some previous experience in this work would be an advantage.

Applicants should possess at least a Higher National Certificate in Electrical Engineering.

The posts are graded under Schedule A of the National Joint Board Agreement, Class K (Area) as Grade 11, £950 to £1,215 per annum, inclusive of London allowance. (Ref. PER/V/3385/R.)

Application forms may be obtained from the Construction Engineer at the above address.

2015

ASSISTANT EXPERIMENTAL/ EXPERIMENTAL OFFICER

D.S.I.R. requires ASSISTANT EXPERIMENTAL OFFICER/EXPERIMENTAL OFFICER at Radio Research Station, Ditton Park, Slough, Bucks., to prepare abstracts of scientific and technical articles on radio research and development.

Quals.: G.C.E. "A" level in two science or maths. subjects. Over 22, pass degree, H.N.C. or equiv., preferably in Physics or Electrical Engineering generally expected. Experience in radio research development or communication; ability to reach technical papers in French, German or Russian an advantage.

Salary: A.E.O. £450 10s. (age 18) to £776 (age 26) to £957; E.O. £1,057-£1,296.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A.104/1A. Closing date 8th September, 1961.

1981

LEADING ELECTRICAL CONTRACTORS

have the following vacancies :—

TWO SENIOR CONTRACTS ENGINEERS capable of dealing with major installations from estimate to final account stage.

EXPERIENCED ENGINEERS for planning/estimating and supervision.

YOUNG MEN with clerical ability, preferably some site experience, for progress, checking and taking off quantities.

Vacancies in Midland and Merseyside areas.

LEE BEESLEY
119, Holloway Head, Birmingham, 1
Tel. Midland 9541

1944

Situations Vacant (continued)

ELECTRICAL ENGINEERS

STEEL, PEECH & TOZER, a branch of the United Steel Companies Ltd., have vacancies on their staff for qualified Electrical Engineers to assist in their extensive development programme.

HIGH-VOLTAGE ENGINEER

(Senior appointment)

Applicants should have had a sound training and experience in the construction, operation and maintenance of H.V. switchgear, transformers and underground works distribution systems.

The successful candidate will assist in the preparation of specifications for oil-immersed and air blast switchgear up to 33 kV, cabling, and associated equipment, and will be directly responsible to the Chief Electrical Engineer for safety operating procedures, and for all future maintenance of H.T. equipment used for arc furnace and rolling mill applications.

Qualification A.M.I.E.E. or equivalent. Commence duties January, 1962, or earlier.

ASSISTANT ENGINEER

(New Construction)

Applicants should possess sound knowledge and experience of all types of industrial A.C. and D.C. motors, control gear and cabling installations. Experience with contactor control gear, and with the latest control techniques, including electronics, would be an advantage.

The successful candidate will be responsible to the New Construction Engineer (Electrical) for the supervision of site installation work, testing and commissioning of new equipment.

Minimum qualification H.N.C. in Electrical Engineering (Grad. I.E.E. preferred) and age 25-35. Commence duties September, 1961, or as soon as possible.

Salaries will be determined by qualifications, age and experience. The appointments will be permanent and pensionable.

Applications should be made in writing to the Labour Manager, Steel, Peech & Tozer, The Ickles, Rotherham, Yorkshire.

1896

EXPERIMENTAL OFFICER OR ASSISTANT EXPERIMENTAL OFFICER

required by the PROOF AND EXPERIMENTAL ESTABLISHMENT, SHOEBURYNESS. Work will be in Instrumentation Research Group, concerned with the study and improvement of existing forms, and research, development and design of new forms of instrumentation on War Office ranges. Initially work will be in the field of special-purpose telemetry and control systems for fixed instrumentation.

Quals.: Pass Degree, H.N.C. Electronics or Physics or G.C.E. (A) Physics and Maths., and 4 subjects G.C.E.(O). Should have good working knowledge of basic electronics technique.

Age: A.E.O. 18-27, salary £458-£983; E.O. min. age 26, £1,087-£1,336. Starting salary allows credit for approved postgraduate experience and National Service. Opportunity for establishment and promotion.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting reference D.384/1A.

1979

AIR MINISTRY

MAIN Grade and Basic Grade MECHANICAL AND ELECTRICAL ENGINEERS required for design, construction and maintenance of installations on (a) airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas and (b) certain Civil Airports.

SALARY according to age, quals. and exp. ranges for Main Grade Engineers from £1,456 to £1,950 (max.) and for Basic Grade from £936 (at 25) to £1,430 max., with an increase for London and slight decrease in country districts. In addition basic grade salary is increased by £95 p.a. (within the maximum of the scale) after 2 years' approved service subject to being Corporate Member of Institution of Mechanical or Electrical Engineers. Appointments long term with good prospects of pension and advancement to numerous posts in higher grades, viz.:—

MAIN GRADE MECHANICAL AND ELECTRICAL ENGINEERS, £1,456-£1,950. 125 posts.

SENIOR MECHANICAL AND ELECTRICAL ENGINEERS, £2,080-£2,392. 34 posts.

SUPERINTENDING MECHANICAL & ELECTRICAL ENGINEERS, £2,650 upwards. 9 posts.

Vacancies occurring in these higher grades are, as a rule, filled by promotion of existing staff.

Good opportunities for acquiring experience overseas where special allowances ranging at present up to £1,800 p.a. according to location and marital status are payable in addition to a higher salary. 5-day week with 4 weeks 2 days paid leave p.a. initially.

QUALS.

(a) Graduate (for Basic Grade) or Corporate (for Main Grade) Membership of I.E.E. or I.Mech.E. (with appreciable electrical engineering experience) with at least 3 years' apprenticeship; or

(b) University degree (honours for Main Grade) or equivalent diploma in electrical and/or mechanical engineering with at least 2 years' apprenticeship.

In addition all candidates should have been employed for minimum of 2 years with well-established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural-born British subjects and, for basic grade posts, between ages 25 and 35. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.128/1A. Selection will be by interview in London and certain expenses will be reimbursed.

260

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

CONTRACTING ENGINEERS required in the St. Helens and Runcorn Districts of the Board's No. 2 Sub-Area.

The salary for the St. Helens post is within range £1,040/£1,165 per annum (N.J.B. H/9) and for the Runcorn District £965/£1,090 per annum (N.J.B. G/9).

Applicants must have served a recognised apprenticeship and have experience of all types of electrical installation work, including estimating and supervision of work on site. Sound technical training is essential, and the possession of a technical qualification would be an advantage.

Appointments subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date 25th August, 1961.

Previous applicants remain under consideration.

1967

KAMPALA MUNICIPAL COUNCIL

Uganda, East Africa

WORKS SUPERVISOR (Electrical) required in scale £1,143-£1,671, plus 6% gratuity on completion of contract of 21/27 months; 4 months' paid leave and air passages for officer and family after two years; provident fund (adds 7½% to salary); housing at nominal rent; medical and dental benefits; car loan and allowances; good climate and conditions.

Applicants must have served a 5-year apprenticeship with a recognised electrical undertaking or company and hold the Ordinary National Certificate (electrical) or equivalent qualification. Works training and experience in maintenance and repair of S.G.E. and/or A.T.E. vehicular actuated traffic signals essential.

The duties envisaged are:—

(a) Principally on the installation and maintenance of the vehicular actuated traffic signals (half-time).

(b) On the maintenance and repair of electrical systems of automotive plant (one-sixth).

(c) On the installation and repair of electrical installations in private houses, buildings, workshops, etc., including apparatus (one-sixth).

(d) On the installation, maintenance and repair of electrical motor pumps, varying from fractional horse-power up to 65 h.p. nominal rating (one-sixth).

All applicants must be fully conversant with the I.E.E. Regulations covering electrical equipment in buildings.

Apply, giving age and 2 referees, to the Town Clerk, P.O. Box 210, Kampala, Uganda, by 31st August, 1961. Canvassing disqualifies.

1983

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointments in the ELECTRICAL DEPARTMENT at Divisional Headquarters, Cockfosters (North London).

THIRD ASSISTANT ENGINEER (Metering) (S.V. No. 1459).

Salary N.J.B. Class AX, Grade 8, Scale 10, £1,105-£1,325 per annum plus London weighting £50 per annum.

The duties of the successful applicant will be to assist in the general duties of the Metering Section and in the design of and the preparation and details for the specifications for new bulk supply and operational metering equipments.

In addition to assist in the preparatory and associated duties in connection with individual and general modifications to existing metering equipments and in the installation and testing of new and special electrical measuring devices.

Applicants should have the Higher National Certificate in Electrical Engineering or equivalent qualifications, and should have practical experience with bulk supply metering equipments using electro-mechanical summation.

Applications, quoting the appropriate Reference S.V. No. 1459, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 2nd September, 1961.

1975

AIR MINISTRY

require STATION ENGINEERS ELECTRICAL (GRADE III) to supervise the installation, operation and maintenance of electrical plant at R.A.F. and Ministry of Aviation establishments in the U.K. and at R.A.F. Stations overseas. 5-day week with 18 days' paid leave a year initially.

SALARY, which is dependent on age, quals. and exp., ranges in the U.K. from £776 (age 25) to £961 max. in Grade III. There are pension prospects and also opportunities of advancement to numerous posts in the higher grades, viz.:—

Technical Grade II, £961-£1,098. 280 posts.
Inspector of Works, Grade I, £1,098-£1,348. 140 posts.
Technical Grade B, £1,348-£1,552. 20 posts.
Technical Grade A, £1,439-£1,697. 17 posts.

Vacancies occurring in these higher grades are, as a rule, filled by promotion of existing staff.

OVERSEAS TOURS. Salary £826 (age 25) to £1,014 (max.) plus tax-free foreign service allowance which varies according to location, marital status, etc., and ranges at present up to £1,800 p.a. Expatriation and kit allowances and free passage for self and family when accommodation arranged. Free medical and child education arrangements.

QUALS. AND EXP. Applicants, who must be natural-born British subjects up to age 55, should have served an apprenticeship and hold an O.N.C. or C. and G. Technical Cert. or equiv. Experience is required in one or more of the following :—

Electrical generation.
Electrical distribution, H.T. & L.T.
Electrical installations, industrial & domestic.
Light current and/or electronic engineering.

Internal training courses provided and financial assistance and time off allowed for recognised courses of study leading to higher quals.

Forms from Manager (P.E.I.), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised.

263

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

THIRD ASSISTANT ENGINEER (Protection) required at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within the range of £1,275 - £1,410 per annum (N.J.B. M/10).

Duties will include power system protection and the testing and commissioning of H.V. cables, switchgear, transformers and associated equipment up to 33 kV.

Applicants should have had a general experience in the electricity supply industry and be technically qualified.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 25th August, 1961.

1968

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

Longridge House, Manchester, 4

ELECTRICAL SURVEYORS required for Manchester and Sheffield districts. Permanent positions carrying progressive salary scale £825 to £1,225, with non-contributory pension.

Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

1989

ELECTRICITY MEB MIDLANDS BOARD

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER required in the Cannock District of the Wolverhampton Area.

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable.

Salary £890/£1,015 per annum (N.J.B. Grade F.9). Superannuable.

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. D. Holt, Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,
Secretary.

1987

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Electrical Engineer's Department, Northfleet

THIRD or FOURTH ASSISTANT ENGINEERS (Technical) (Vacancy Notice No. 147C/61). Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualifications and have had experience of the commissioning and maintenance of automatic protective gear and control gear of the type associated with major electrical plant in the Generating Board's power stations and substations, and of investigating faults on such plant. Ability to make calculations of balanced and unbalanced fault conditions and to write a good report is also desirable.

The appointment is offered at either Fourth Assistant Engineer level with a salary within the range £940-£1,215 per annum including London allowance, with prospect of promotion subject to satisfactory service, or Third Assistant Engineer level with a salary within the range £1,180-£1,460 per annum including London allowance, according to qualifications and experience.

The successful candidate will be required to live within approximately 10 miles of the District Headquarters at Northfleet.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by the 21st August, 1961.

1976

Eastern Electricity

Fens Sub-Area

Commercial Assistant, Cambridge Branch

CANDIDATES should be fully experienced in modern electrical installation practice and be able to prepare specifications and competitive quotations for domestic, commercial and industrial installations. The position offers the successful applicant a good opportunity to broaden his knowledge of commercial contracting work in a large branch with both urban and rural characteristics.

Salary N.J.C. Grade 3, £780-£880.

Applications in writing with full details should be addressed to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 1st September, 1961.

2007

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division, South Western Region

SHIFT CHARGE ENGINEER,
COWES GENERATING STATION.

Applicants should have had previous experience in a generating station and preferably have had manufacturing works experience. Preference will be given to those possessing qualifications admitting to corporate membership of a recognised professional engineering institution.

Salary N.J.B. E/7, Scale 7, £965-£1,090.

Special application forms, obtainable only from Divisional Secretary, Central Electricity House, High St., Portsmouth, should be returned by 31st August, 1961.

STATION CHEMIST,
PORTSMOUTH GENERATING STATION.

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station and a knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage. Preference will be given to candidates with Higher National Certificate in Chemistry or with equivalent qualifications.

Salary N.J.B. H/7, Scale 10, £1,190-£1,325.

Special application forms, obtainable only from Divisional Secretary, Central Electricity House, High St., Portsmouth, should be returned by 31st August, 1961.

2017

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

West Midlands Division

APPLICATIONS are invited for the position of SECOND ASSISTANT STATION CHEMIST at Nechells "A" and "B" Power Stations.

Applicants should have previous experience in either a power station or industrial laboratory and should preferably possess H.N.C. in Chemistry, and be conversant with the analysis of fuels, water and oils.

Salary in accordance with the N.J.B. Agreement, Schedule A, Grade K.11, £1,040-£1,165 per annum.

Apply, quoting Vacancy No. 211/61MD, on form AE6, available from the Station Superintendent, Nechells Power Stations, Nechells, Birmingham, 7, to whom they should be returned to arrive not later than 28th August, 1961.

2021

MANCHESTER CORPORATION WATERWORKS UNDERTAKING

ASSISTANT ENGINEER (Electrical) required. Salary in accordance with A.P.T. I/II (£645/£960).

Applicants should have served a recognised apprenticeship, with subsequent D.O. experience, and preferably have H.N.C. or equivalent qualification.

The appointment offers interesting experience in the maintenance of installations (domestic, pumping stations, control schemes, etc.) situated in Manchester, at headworks and on aqueducts; also in the design, construction and commissioning of electrical installations for large plants to be constructed.

Application form (returnable by 1st September) and further details from the Engineer and Manager, Waterworks Department, Town Hall, Manchester, 2.

2023

***Situations Vacant** (continued)*

PROJECT SALES ENGINEER

required by

N S F LIMITED

The successful applicant will be directly responsible to the Sales Manager for co-ordinating liaison between customers and the company's development and sales departments in respect of small power (up to 20 amps. rating) switches used in electronic equipment, domestic electrical appliances, portable electric tools, etc.

Applicants are to be between 30 and 40 years of age and shall have an engineering degree or H.N.C. Design and production experience in the appropriate fields is necessary and previous sales experience, although not essential, is desirable.

The post is progressive and the salary will be commensurate with experience. The company is a member of the Simms Group of Companies and a contributory pension scheme is in operation.

Applications, which will be received in strict confidence, should provide full details of education, experience and present salary, and are to be addressed to :—

The Sales Manager
N S F LIMITED
31, Alfred Place, London, W.C.1

1995

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a THIRD ASSISTANT ENGINEER in the Contracting Section of the Chief Commercial Officer's Department at Board Head Office.

Candidates should, preferably, possess a Higher National Certificate in Electrical Engineering, have had a sound theoretical training and some practical experience in general electrical installation practice in industrial, commercial and domestic premises. The successful applicant will be required to assist generally in the planning and progressing of electrical installation contracts.

Salary N.J.B. Class K, Grade 8, £1,145/£1,410 per annum.

Applications on the standard form, quoting reference C12/61, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 1st September, 1961.

1994

MINISTRY OF AVIATION

requires ELECTRICAL ENGINEERS (Assistant Signals Officers) for aviation telecommunications and electronic navigational aids. Min. age 23; 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.Ae.S. (candidates with Parts I, II & III of A.M.I.E.E. or Parts I & II of A.F.R.Ae.S. or equiv., or of very high professional attainment without those qualifications considered).

Salary £835 (age 23) to £1,318 (age 34), max. £1,490. Slightly lower outside Inner London. Prospects.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting D.411/1A.

249

THE LYON GROUP

require a JUNIOR ASSISTANT in the Electrical Design and Contracting Department. Good future prospects in a progressive and expanding organisation.

Applications in writing to Electrical Manager, Ronald Lyon Construction Limited, Auckland House, New Zealand Avenue, Walton-on-Thames, Surrey. 1996

McGEOCH GROUP

comprising

WILLIAM McGEOCH & CO. LIMITED
Veritys (Maxlume) Limited
Veritys (Switchgear) Limited

APPLICATIONS are invited for the position of AREA SALES ENGINEER to cover the counties of Durham, North Riding of Yorkshire and East Riding of Yorkshire, preferably residing in Middlesbrough area.

Applicants should have good contacts with the electrical industry, including electricity boards, industrial users, wholesalers and contractors. Experience of L.T. switchgear, industrial fittings, including flameproof. Knowledge of lighting schemes an advantage. Salary according to experience, plus commission and expenses. Car can be provided. Superannuation scheme in operation.

Apply in strict confidence stating age, salary expected, with details of experience, to :—

Sales Manager
WILLIAM McGEOCH & CO. LIMITED
Bordesley, Birmingham, 10

1951

HUNTINGDONSHIRE COUNTY ARCHITECT'S DEPARTMENT

Technical Assistant (Electrical Engineer)

APPLICATIONS are invited for the above appointment on Grade A.P.T. 3 (£960-£1,140) or Grade A.P.T. 4 (£1,140-£1,310). Applicants for the Grade A.P.T. 4 post must be Chartered Electrical Engineers (A.M.I.E.E.).

The person appointed will be a member of the engineering section of the department, and his duties will consist of all works connected with electrical installations related to both small and large building projects.

Application forms may be obtained from S. M. Holloway, A.R.I.B.A., County Architect, County Buildings, Huntingdon, and completed forms should be returned to the undersigned by Monday, 28th August, 1961.

A. C. AYLWARD,
Clerk of the County Council.

County Buildings,
Huntingdon.

1927

SENIOR DESIGN ENGINEER

required to take charge of a design office of a medium-sized control gear manufacturer. Experience of contactor and air breaker design required.

Applicants should be Chartered Electrical Engineers or have equivalent technical qualifications.

The post offers considerable scope as an extensive development programme is envisaged.

This is a senior position and carries a commensurate salary.—Box 1945.

MINISTRY OF AVIATION, ELECTRICAL INSPECTION

requires TECHNICIANS at Bickley, Kent, for work associated with inspection of electrical power equipment. Quals.: Recognised eng. apprenticeship; O.N.C., C. & G. Final Certs. or equiv.

Salary £1,028 (on entry) to £1,173. 3½ weeks' annual leave. Good prospects for promotion and pension. Technical college courses sponsored for suitable candidates.

Application forms from Manager (PE.3166), Ministry of Labour, Professional and Executive Register, Atlantic House, Farrington Street, London, E.C.4.

1942

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

General Assistant Engineers

APPLICATIONS are invited for the above posts. There are 3 vacancies, namely, at Dingwall, Wick and Stornoway.

Minimum technical qualification: Ordinary National Certificate in Electrical Engineering. Experience on H.V. and L.V. underground and overhead distribution systems will be an advantage.

Salary: Dingwall and Wick posts, £715-£805 (N.J.B. D.10, Scale 3); Stornoway post, £670-£750 (N.J.B. C.10, Scale 2).

Superannuation scheme.

Application forms, obtainable from Area Manager, should be returned by 31st August, 1961.

1964

SOUTH WALES ELECTRICITY BOARD

Commercial Assistant

APPLICATIONS are invited for the position of Commercial Assistant in the South Cardiganshire District, based at Lampeter, of the West Wales Area.

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class E, Grade 9, Scale 5 (£825/£940 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to E. Broughton, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, Pembs., to arrive not later than 2nd September, 1961.

Please quote reference 56/61/ER, endorsing envelope "Commercial Assistant."

R. G. WILLIAMS,
Secretary.

2019

NORTH EASTERN ELECTRICITY BOARD

Third Assistant Engineer

APPLICATIONS are invited from suitably qualified engineers for the above appointment in the Chief Engineer's Department, Technical Section, at the Board's Headquarters, Carliol House, Newcastle upon Tyne. Applicants should be experienced in all aspects of work connected with system protection, including fault flow calculations.

Salary Class K, within Grades 7-8, £1,145/£1,500 per annum, according to qualifications and experience. N.J.B. conditions of service.

Applications in writing, stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement.

2020

MINISTRY OF LABOUR

requires professional Electrical Engineer (unestablished) at the Technical and Scientific Register, 28, King Street, London, S.W.1.

Candidates should hold A.M.I.E.E. or degree or diploma in electrical engineering, with experience of heavy electrical engineering. Some knowledge of electronics an advantage. Duties: to assist in employment and advisory services for electrical engineers, including correspondence and interviewing.

Salary range £1,318-£1,547.

Forms from above address, quoting reference (K) D.410/1A. Closing date 31st August, 1961.

1980

LONDON ELECTRICITY BOARD

Assistant Distribution Engineers (2)

APPLICATIONS are invited for the above positions in the Board's Western District. The successful applicants will be based at 154, Uxbridge Road, Shepherd's Bush, London, W.12, but will be required to work anywhere in the District.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum rising to £1,215 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address within 14 days of the publication date of this notice. Please quote ref. PER/V/3223/R.

1943

SOUTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER, BATH.

Salary within Class G, Grade 11, Salary Scale 5 (£825 to £940 per annum) of the N.J.B. Agreement.

The successful candidate will be required to assist generally in operation, maintenance and construction work within the District.

Previous experience of overhead and underground H.V. and L.V. networks and substations, and qualifications leading to the Higher National Certificate in Electrical Engineering and the ability to drive a car are desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Old Bridge, Bath. Closing date for receipt of completed applications is 31st August, 1961.

1970

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Mechanical) required at Ironbridge Power Station, Buildwas, Salop. N.J.B. service conditions, superannuable appointment, salary within Grade J.7, £1,275 - £1,410 per annum.

Applicants should have served an apprenticeship and possession of technical qualifications of H.N.C. level or leading to corporate membership of a major engineering institution would be an advantage. Applicants should preferably have experience of mechanical maintenance at a modern power station.

Apply, quoting Vacancy No. 205/61MD, on form AE6, available from the Station Superintendent, Ironbridge Power Station, Buildwas, Salop, to whom they should be returned by 25th August, 1961.

1949

ACTIVE and dependable electrical contracting, supervising and estimating engineers required as MANAGERS and ASSISTANTS TO MANAGERS for expansion of provincial branches. Applicants should be fully experienced in all types of industrial and commercial installations, preferably including substation layout, and with knowledge of preparation of final accounts. Excellent prospects.

Apply in confidence to Managing Director, LEE, BEESLEY & CO. LTD., 6, Warwick Row, Coventry.

1948

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Third Assistant District Engineer (Lanark District)

APPLICATIONS are invited for the above appointment. Applicants should have experience in the operation and maintenance of H.V. and L.V. distribution systems and be conversant with load flow diagrams and voltage drop calculations.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, the present classification and grading being E.9 (Scale 5), £825/£940 per annum. The position is superannuable.

Application forms, which can be obtained from the Area Manager, Montrose Crescent, Hamilton, should be returned to this office within fourteen days from the date of this advertisement.

1998

PATENT EXAMINERS AND PATENT OFFICERS

PENSIONABLE posts for men or women for work on the examination of Patent applications. Age at least 20 and under 29 (36 for Examiners) on 31.12.61, with extension for regular Forces service and Overseas Civil Service.

Qualifications: normally a Degree, or a Diploma in Technology, with first or second class honours in physics, chemistry, engineering or mathematics, or equivalent attainment, or professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C., A.Inst.P.

Inner London salary £793 to £1,719; provision for starting pay above minimum. Promotion prospects.

Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting **S/128/61** and stating date of birth.

1992

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 11 (£825-£940 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. Applicants should possess suitable technical qualifications.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him, quoting Z.1390, not later than 28th August, 1961.

2016

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

Longridge House, Manchester, 4

ELECTRICAL SURVEYORS required for Manchester and Sheffield districts. Permanent positions carrying progressive salary scale £825 to £1,225 with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

1950

CONTACTOR DESIGNER

required by a well-established manufacturer of control gear. Applicants should have H.N.C. and experience in the detailed design of medium-voltage contactors.

Apply in confidence with all details of age, qualifications and experience to—Box 1946.

FOREMAN ARMATURE WINDER

required to take charge of Winding Department.

Excellent prospects.

Assistance with housing, transport, etc.

SHOOLBRED ELECTRICAL CO. LTD.

1, Langley Street, Luton

Telephone Luton 2930

1962

ELECTRICAL MACHINE DESIGNER

required for manufacturers in S.W. Lancs. H.N. Certificate minimum. Should be familiar with detail design of all types of A.C. and D.C. machines and electro-magnetic equipment.

Progressive post with contributory superannuation scheme after qualifying period.

State age, qualifications, previous experience and salary required. All applications in strict confidence. — Box S.959, Lee & Nightingale, Liverpool, 2.

158

A DIRECTORATE is offered to an experienced electrical engineer in a small/medium contracting company. Full details of experience, etc.—Box 8318.

ARMATURE winder required with experience of machines up to 100 h.p. Ideal opportunity for young skilled man to establish a permanent position and gain further experience. Apply in writing, giving age, experience and present wages to the Works Employment Officer, Fuller Electric Ltd., Fulbourne Road, Walthamstow, London, E.17. 1826

ASSISTANT editor required by "Science Abstracts," Section B (Electrical Engineering). Engineering or science degree, or corresponding qualification. Some knowledge of most branches of electrical engineering. Acquaintance foreign languages essential and experience research, development or information work desirable. Comm. salary £1,000, plus or minus an amount to be determined according to age, quals. and exp. Progressive post. Pension scheme; 5-day week; staff restaurant. Apply — Secretary, I.E.E., Savoy Place, London, W.C.2. 1999

ASSISTANT engineer required to train in preparation of estimates for overhead line construction. Permanency right man.—Box 1954.

CHAMBERLAIN & HOOKHAM Ltd. require representatives for the sale of process and sequence timers, and other electro-mechanical mechanisms having special industrial applications. Sound electro-mechanical instrument background essential. Car provided. Pension scheme. Applications, which will be treated in the strictest confidence, should state age, details of experience and salary required, and addressed as follows — Ref. Timer Sales Representatives, Chamberlain & Hookham Ltd., Magnet House, Kingsway, London W.C.2. 1933

CHAMBERLAIN & HOOKHAM Ltd. require technical representatives for the sale of protective and auxiliary relays. The types of relays produced have recently been extended and now presents a fully comprehensive range for all purposes. Applicants must be Corporate Members of the Institution of Electrical Engineers and should have practical experience in the use and application of relays. Successful applicants will be required to travel throughout the British Isles and will be based in London. Salary according to experience. Car provided. Pension scheme. Applications, which will be treated in the strictest confidence, should state age, details of experience and addressed—Ref. Relay Sales Representatives, Chamberlain & Hookham Ltd., Magnet House, Kingsway, London, W.C.2. 1934

CONTRACTORS, senior and assistant engineers required by well-established firm, central London, for quality work of all types. Positions offer scope for advancement for capable and energetic engineers. Write fullest detail, in confidence, of experience, training, age and salary required.—Box 133.

Situations Vacant (*continued*)

CHAMBERLAIN & HOOKHAM Ltd. require two area meter sales managers for the London, Eastern and Southern area and Northern England, and Scotland area. Sound electrical training and experience in the field of meter sales and ancillary equipment is essential. Top salary for men having suitable qualifications. Car provided. Pension scheme. Applications, which will be treated in the strictest confidence, should state age and details of experience and addressed to — Ref. Meter Sales Managers, Chamberlain & Hookham Ltd., Magnet House, Kingsway, London W.C.2. 1932

CONTRACTORS N.W. Lond. require experienced cost accounts clerk for interim valuations and preparation of final accounts. This is a senior appointment offering good salary, pension and housing facilities. Only those with similar experience should apply. Write full details—J. W. Russell Limited, 18, Queens Road, Watford. 1901

CONTRACTORS who specialise in overhead line and cable laying contracts require young engineers with experience and initiative. —Box 1891.

DEGENHARDT & Co. Ltd., British agents for Carl Zeiss, Oberkochen, and Hamilton-Electrona, Zurich, require an electronics service engineer for installation and service of the new Hamilton 150-kV electron beam welding unit. Radar or high-voltage experience essential and some knowledge of optical instruments an advantage. Training will be given at the Carl Zeiss Works, Western Germany. Apply in writing to 6, Cavendish Sq., London, W.1. 1982

DRAUGHTSMAN: Lyons Maid, Ice Cream Division. J. Lyons & Company Limited invite applications for the vacancy of senior electrical draughtsman with previous experience of motor controls, estimating, general distribution and lighting. An attractive salary will be paid according to qualifications and experience. The appointment provides good prospects for further advancement. The drawing office is situated in West London. Pension scheme. Applications to be made in writing to the Personnel Manager, Lyons Maid House, Hammersmith Grove, London, W.6. 1984

ELECTRICAL contract engineers (2) required with at least H.N.C. or equivalent for medium/heavy industrial rotating plant and associated control gear. Also one assistant. Interesting work with good prospects. Applications stating age, qualifications and experience to—Contracts Manager, Harland Engineering Co. Ltd., Drives Division, 47/48, Berners St., London, W.1. 2025

ELECTRICAL engineer required for large expanding contracting organisation. Applicants should have experience in designing and estimating all classes of industrial and commercial installations. This position carries a good salary and is superannuated. Applications in strict confidence to the Managing Director, Scull Electrical Ltd., Redcliffe House, Bristol, 3. 2029

ELECTRICAL wholesale manager required for depot in Bournemouth. Wholesale experience and ability to work on own initiative essential. Good commencing salary and scope for advancement. Superannuation. Full personal details to—William Dibben & Sons Ltd., 62, Commercial Road, Southampton. 8316

ESTIMATING and supervising engineer. A vacancy occurs with S.W. London electrical contractors for enthusiastic man willing to progress with company. Experience in all size contracts essential and will be responsible from enquiry to final account. Salary £910 p.a. plus bonus on proved annual ability and mileage rates on own car. Write full details, age, experience, employers in strictest confidence to—Box 8315.

ESTIMATING/supervising engineer for large contractors' office; must be thoroughly experienced. Write stating qualifications, salary required to — Ref. HAR, Holliday Hall & Stinson Limited, 222, Balham High Road, London, S.W.12. 2002

EXPERIENCED electricians used to general contracting work; good prospects with expanding company. Apply in confidence—F. W. Blanshard Ltd., 23, Lansdowne Road, Purley, Surrey. 2027

HALSEY'S ELECTRIC Co. Ltd., Brandon House, Wyfold Road, Fulham, London, S.W.6, require sales order clerk of ability who has had previous experience in a similar capacity in the electrical industry. This is a permanent position with a commencing salary of up to £800 per annum. Canteen facilities, pension scheme and excellent working conditions. 1937

EXPERIENCED H. and V. electrical and air conditioning design engineers are invited to apply for positions with well-known firms of architects overseas. Applicants should apply in writing stating age, experience, etc., to—Box 2026.

MOTOR repairs and sales. Opportunity for a man to take charge of small department. Must be experienced in all aspects of armature winding and repair work. Ability to administrate and further sales is essential. Write full particulars to—Box 1956.

MUNICIPAL MUTUAL INSURANCE Limited has a vacancy for an electrical surveyor in Birmingham. Post is permanent and pensionable to satisfactory candidate who should have served an apprenticeship and have sound practical and theoretical knowledge. Technical qualification: Higher National Certificate. Salary £825 rising to £1,225 per annum. Apply in own handwriting marking envelope "Application Engineer Surveyor" and "Private and Confidential," to the Chief Engineer, 22, Old Queen Street, London, S.W.1. 1972

PURCHASING assistant, for electrical contractors. Previous experience with wholesaler or contractor essential. Write stating qualifications, salary required to—Holliday Hall & Stinson Limited, 222, Balham High Road, London, S.W.12. 2001

REPRESENTATIVE required by established East London wholesaler to cover N.W. London. Preferably with contacts in this area. Salary, commission and car allowance, also pension scheme. Write details—Box 2028.

REPRESENTATIVE to contact London electrical retail trade and contractors. Details age, experience, etc., to—Box 2000.

REPRESENTATIVE urgently required by the electrical division of a large group of companies who have recently entered the domestic appliance market. Area to be covered North of England Electricity Board. Superannuation scheme. Car provided.—Box 1973.

SALES/contracts engineer for small expanding sales team in compact battery charger/rectifier equipment manufacturing company. Battery and/or charger/rectifier experience preferred. Progressive post. Pension scheme. Salary commensurate with experience. Apply in strictest confidence giving full details to—W. E. Simmons, Harmer & Simmons Ltd., Roebuck Road, Hainault, Essex. 8319

SENIOR and junior electrical engineers required for London consulting engineers' office for installation design of industrial, commercial and educational buildings. Apply stating age, experience, training and salary required to Box 1783, or 'phone Welbeck 3564.

SURVEYOR required for preparation of route profiles for wood pole lines. Permanency right man.—Box 1955.

WELL-known electrical wholesaler requires salesmen, preferably at present engaged in a similar capacity in the electrical wholesale industry. The right applicants who have established connections can be assured of a progressive future with a guaranteed minimum remuneration at the rate of £1,000 per annum plus car allowance and out-of-pocket expenses. —Box 1936.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

TRANSFORMER engineer, graduate, 10 yrs.' experience designing wide variety of power and rectifier transformers 5 VA to 5 MVA, desires change of location.—Box 8312.

ARTICLES FOR SALE

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

600

750-h.p. ROLLING MILL MOTOR by BROWN BOVERI, wound for 2,200 volts, 3-phase, 50 cycles supply, speed 146 r.p.m., 0.75 power factor, continuously rated, suitable for reversing on load if required. Mounted on baseplate with two pedestal ring oil-lubricated bearings.

FOUR 400-h.p. ROLLING MILL MOTORS by the ENGLISH ELECTRIC Co., wound for 400 volts, 3-phase, 50 cycles supply, speed 738 r.p.m., coupled to gearbox giving final 30 r.p.m. With barring motor and control gear.

150-kW, 520-volt D.C. MERCURY ARC RECTIFIER by BRUCE PEEBLES, 289 amps. continuous duty, 361 amps. for two hours. In sheet steel cubicle, with voltmeter 0/700, ammeter. Complete with spare glass bulb and transformer, primary 3,300 volts.

GEORGE COHEN
Sons & Co. Ltd.

Wood Lane, London, W.12
(Tel. Shepherds Bush 2070)

Stanningley, Nr. Leeds
(Tel. Pudsey 2241)

Cogan St., Pollokshaws, Glasgow, S.3
339

MOTORS

NEW CROMPTON PARKINSON, from $\frac{1}{4}$ h.p. to 80 h.p.; also 6,000 A.C. and D.C. reconditioned Motors and Starters.

IN STOCK HERE

B. E. WHITE
Brantwood Rd., Tottenham, London, N.17
Tel. EDMonton 4621-2 215

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish, vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, $2\frac{1}{2}$-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 600 kVA.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

ALTERNATORS for sale from 1,000 kVA at 750 r.p.m. down to $\frac{1}{2}$ kVA. Single and three-phase. All voltages. More than 150 machines in stock. Automatic regulators and switchboards available.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, armoured, P.I.L.C., P.V.C., R.I.L.C., V.C.I.L.C. All sizes in stock at our London works. Cutting and delivery same day as order received. Priced stock lists.—Batt Electrical Co., 6, Dock St., London, E.1 (Tel. Royal 5905). 316

CIRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

FLUORESCENT tubes reconditioned and guaranteed with a life as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Clive Street, Bury (Telephone, Bolton 27251). 212

FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C. — Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

INSULATING varnish, clear, Minerva No. 720, £10 per 40-gal. drum.—Lowton Metals Ltd., Sandy Lane, Lowton St. Mary's, Leigh, Lancs. (Tel. 71441/2). 93

KARDEX, Roneodex and Shannovue cabinets, as new.—F. H. Jolly & Co. Ltd., 280, King St., London, W.6 (RIV. 5381). 202

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

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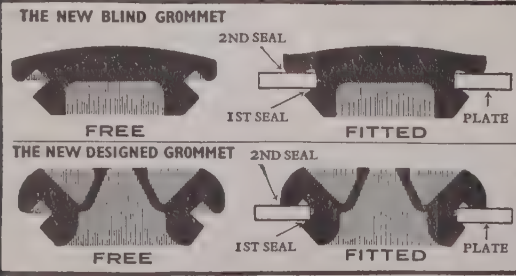

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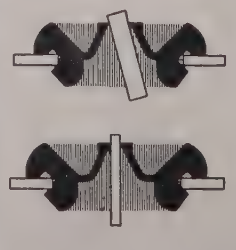

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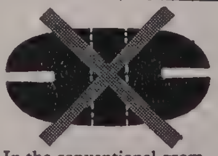

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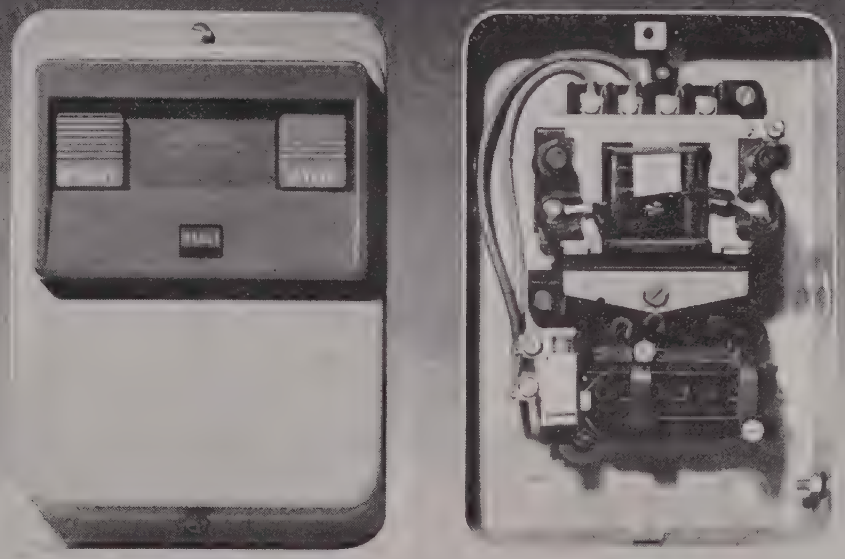

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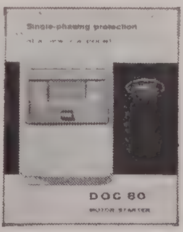

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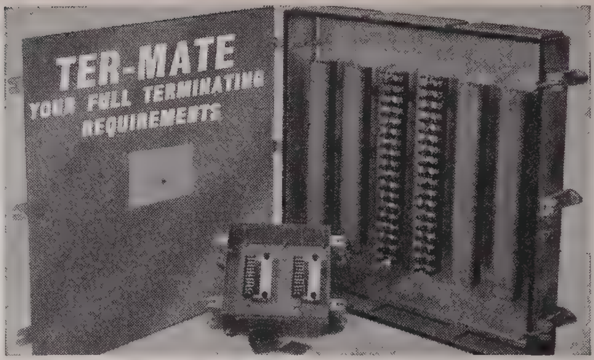

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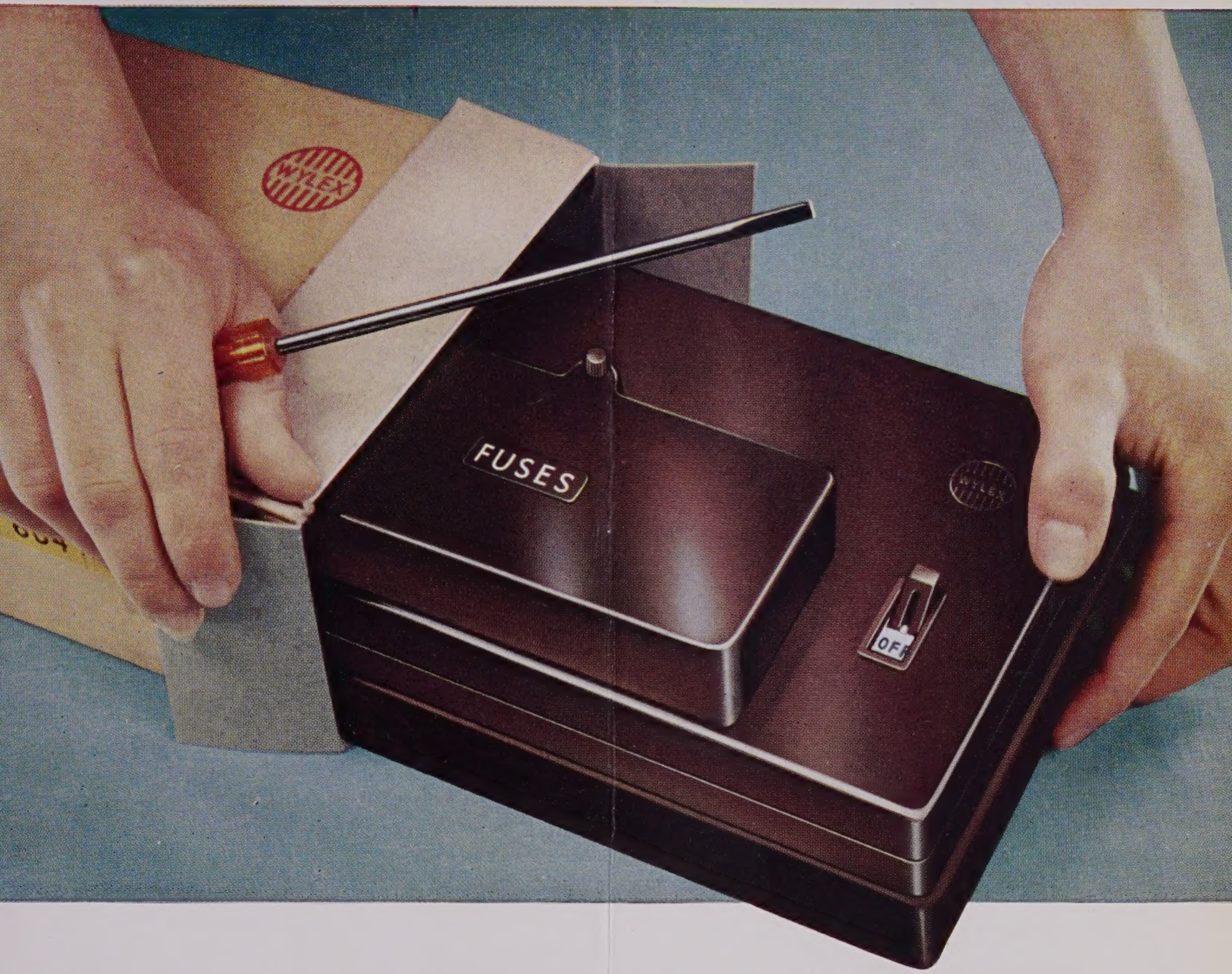

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